THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

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See engravings on page 148, vol. II.

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For engravings, see American Gas-Light Journal for June, 1860, page 245. Address the Patentee. JOHN P. KENNEDY, Trenton, N. J.

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See Engravings in American Gas-Light Journal for July 1, 1860, page 280.

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Samples of the above castings can be seen at the Rooms of the American Gas-Light Journal.

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North Chatham,
North Eastham,
North Falmouth,
North Sandwich,
North Truro,
Orleans,
Osterville,
Pocassett,
Provincetown,
Sandwich,
South Dennis,
South Harwich,
South Orleans,
South Sandwich,
South Wellfleet,
South Yarmouth,
Spring Hill,
Truro,
Waquoit,
Wellfleet,
West Barnstable,
West Brewster,
West Chatham,
West Dennis,
West Falmouth,
West Harwich,
West Sandwich,
West Yarmouth,
Wood's Hole,
Yarmouth,
Yarmouth Port.

Berkshire County.

Adams,
Alford,
Ashley Falls,
Bancroft,
Becket,
Berkshire,
Blackinton,
Boston Corner,
Cheshire,
Cold Spring,
Curtisville,
Dalton,
East Lee,
East Sheffield,
East Windsor,
Egremont Plain,
Florida,
Glen Dale,
Great Barrington,
Hancock,
Hartsville,
Hinsdale,
Hinsdale Depot,
Hoosatonic,
Housatonic,
Lanesborough,
Lee,
Lenox, (c. h.,)
Lenox Furnace,
Mill River,
Monterey,
Montville,
New Ashford,
New Boston,
New Lenox,
New Marlboro',
North Adams,
North Becket,
North Egremont,
Otis,
Peru,
Pittsfield,
Richmond,
Sandisfield,
Savoy,
Sheffield,
South Egremont,
Southfield,
South Lee,
South Williamstown,
State Line,
Stockbridge,
Tyringham,
Van Deusenville,
Washington,
West Becket,
West Otis,
West Pittsfield,
West Stockbridge,
West Stockbridge Centre,
Williamstown,
Windsor.

Bristol County.

Attleboro',
Berkley,
Dartmouth,
Dighton,
East Freetown,
East Taunton,
Easton,
Fairhaven,
Fall River,
Freetown,
Long Plain,
Mansfield,
Mirickville,
New Bedford, (c.h.,)
North Attleboro',
North Dartmouth,
North Dighton,
North Easton,
North Fairhaven,
North Rehoboth,
North Swansea,
North Westport,
Norton,
Rehoboth,
Seekonk,
Somerset,
South Attleboro',
South Dartmouth,
South Easton,
South Seekonk,
South Westport,
Swansea,
Taunton, (c. h.,)
West Mansfield,
Westport,
Westport Point.

Dukes County.

Chilmark,
Edgartown, (c. h.,)
Holmes' Hole,
West Tisbury.

Essex County.

Amesbury,
Andover,
Annisquam,
Ballard Vale,
Beverly,
Beverly Farms,
Boxford,
Bradford,
Byfield,
Clifton Dale,
Danvers,
Danvers Centre,
Danversport,
East Haverhill,
East Salisbury,
Essex,
Georgetown,
Gloucester,
Groveland,
Hamilton,
Haverhill,
Ipswich, (c. h.,)
Lanesville,
Lawrence,
Lynn,
Lynnfield,
Lynnfield Centre,
Manchester,
Marblehead,
Methuen,
Middleton,
Nahant,
Newburyport, (c.h.,)
North Andover,
North Andover Depot,
North Beverly,
Pigeon Cove,
Rockport,
Rowley,
Salem, (c. h.,)
Salisbury,
Saugus,
Saugus Centre,
South Amesbury,
South Danvers,
South Groveland,
Swampscott,
Topsfield,
Wenham,
West Amesbury,
West Boxford,
West Gloucester,
West Newbury.

Franklin County.

Adamsville,
Ashfield,
Bernardston,
Buckland,
Charlemont,
Colerain,
Conway,
Deerfield,
East Charlemont,
East Shelburne,
East Whately,
Erving,
Gill,
Greenfield, (c. h.,)
Grout's Corners,
Hawley,
Heath,
Leverett,
Leyden,
Lock's Village,
Monroe,
Montague,
New Salem,
Northfield,
Northfield Farms,
North Leverett,
North New Salem,
North Orange,
Orange,
Rowe,
Shelburne,
Shelburne Falls,
Shutesbury,
South Deerfield,
South Hawley,
Sunderland,
Warwick,
Wendell.
Wendell Depot,
West Hawley,
West Northfield,
Whately,
Zoar.

Hampden County.

Agawam,
Ashleyville,
Blanford,
Bond's Village,
Brimfield,
Chester,
Chester Factories,
Chicopee,
Chicopee Falls,
Collins' Depot,
East Brimfield,
East Granville,
East Long Meadow,
Feeding Hills,
Holland,
Holyoke,
Indian Orchard,
Ireland,
Long Meadow,
Ludlow,
Mittineague,
Monson,
Montgomery,
North Blanford,
North Chester,
Palmer,
Russell,
Southwick,
South Wilbraham,
Springfield, (c. h.,)
Thorndike,
Three Rivers,
Tolland,
Wales,
Westfield,
West Granville,
West Springfield,
Willbraham,
Willimansett.

Hampshire County.

Amherst,
Belchertown,
Chesterfield,
Cummington,
Cummington West Village,
East Hampton,
Enfield,
Florence,
Goshen,
Granby,
Greenwich,
Greenwich Village,
Hadley,
Hatfield,
Haydenville,
Huntington,
Middlefield,
North Amherst,
Northampton, (c.h.)
North Hadley,
North Prescott,
Norwich,
Pelham,
Plainfield,
Prescott,
Ringville,
South Amherst,
Southampton,
South Hadley,
South Hadley Falls,
Ware,
West Hampton,
West Worthington,
Williamsburgh,
Worthington.

Middlesex County.

Acton,
Ashby,
Ashland,
Assabet,
Auburn Dale,
Bedford,
Belmont,
Billerica,
Boxboro',
Braggville,
Brighton,
Burlington,
Cambridge, (c. h.,)
Cambridgeport,
Carlisle,
Charlestown,
Chelmsford,
Cochituate,
Concord, (c. h.,)
Dracut,
Dunstable,
East Cambridge,
East Holliston,
East Lexington,
East Pepperel,
East Woburn,
Feltonsville,
Forge Village,
Fermingham,
Groton,
Graniteville,
Greenwood,
Hayden Row,
Holliston,
Hopkinton,
Lexington,
Lincoln,
Littleton,
Lowell,
Middlesex Village,
Malden,
Maplewood,
Marlboro',
Medford,
Melrose,
Mount Auburn,
Natick,
Newton,
Newton Centre,
Newton Lower Falls,
Newton Upper Falls,
Newtonville,
North Billerica,
North Cambridge,
North Chelmsford,
North Reading,
North Sudbury,
North Tewksbury,
North Wilmington,
North Woburn,
Pepperell,
Reading,
Rock Bottom,
Saxonville,
Sherborn,
Shirley,
Shirley Village,
Somerville,
South Acton,
South Farmingham,
South Groton,
South Malden,
South Natick,
South Reading,
Stoneham,
Stowe,
Sudbury,
Tewkesbury,
Townsend,
Townsend Harbor,
Tyngsboro',
Waltham,
Watertown,
Wayland,
West Acton,
West Cambridge,
West Chelmsford,
Westford,
West Groton,
West Medford,
West Newton,
Weston,
West Townsend,
Wilmington,
Winchester,
Woburn,
Woodville.

Nantucket County.

Nantucket, (c. h.)

Norfolk County

Bald Hill,
Bellingham,
Braintree,
Brookline,
Canton,
Charles River Village,
Cohassett,
Dedham, (c. h.,)
Dorchester,
Dover,
East Foxboro',
East Medway,
East Randolph,
East Sharon,
East Stoughton,
East Walpole,
East Weymouth,
Fairmount,
Foxborough,
Franklin,
Franklin City,
Grantville,
Harrison Square,
Jamaica Plain,
Mattapan,
Medfield,
Medway,
Milton,
Needham,
Neponset Village,
North Bellingham,
North Cohassett,
North Weymouth,
North Wrentham,
Plainsville,
Quincy Point,
Quincy,
Randolph,
Rockville,
Roxbury,
Sharon,
Sheldonville,
South Braintree,
South Dedham,
South Franklin,
South Randolph,
South Walpole,
South Weymouth,
South Wrentham,
Stoughton,
Walpole.
West Dedham,
West Foxboro',
West Medway,
West Needham,
West Roxbury,
West Wrentham,
Weymouth,
Wrentham.

Plymouth County.

Abington,
Brigdewater,
Campello,
Carver,
Chiltonville,
Cochesett,
Duxbury,
East Abington,
East Bridgwater,
East Marshfield,
East Middleboro',
East Wareham,
Halifax,
Hanover,
Hanson,
Hingham,
Hull,
Kingston,
Marshfield,
Mattapoisett,
Middleboro',
North Abington,
North Bridgewater,
North Carver,
North Marshfield,
North Middleboro',
North Pembroke,
North Plympton,
North Rochester,
North Scituate,
North West Bridgewater,
Pembroke,
Plymouth, (c. h.,)
Plympton,
Rochester,
Rock,
Scituate,
Scotland,
Sippican,
South Abington,
South Carver,
South Hanson,
South Hingham,
South Middleboro',
South Plymouth,
South Scituate,
Wareham,
West Brigdewater,
West Duxbury,
West Scituate,
West Wareham.

Suffolk County.

Boston, (c. h.,)
Chelsea,
East Boston,
North Chelsea,
Winthrop.

Worcester County.

Ashburnham,
Ashburnham Depot,
Athol,
Athol Depot,
Auburn,
Baldwinsville,
Barre,
Barre Plains,
Berlin,
Blackstone,
Bolton,
Boylston,
Boylston Centre,
Brookfield,
Burrageville,
Charlton,
Charlton Depot,
Cherry Valley,
Clappville,
Clinton,
Cold Brook,
Cordaville,
Dana,
Douglass,
Dudley,
East Brookfield,
East Douglass,
East Princeton,
Farnumsville,
Fiskedale,
Fitchburgh,
Gardner,
Grafton,
Globe Village,
Hardwick,
Harvard,
Holden,
Hubbardston,
Lancaster,
Leicester,
Leominster,
Lunenburgh,
Mendon,
Milford,
Millbury,
Millville,
New Braintree,
New England Village,
North Blackstone,
Northboro',
Northbridge,
Northbridge Centre,
North Brookfield,
North Dana,
North Leominster,
North Oxford,
North Spencer,
North Uxbridge,
Oakdale,
Oakham,
Otter River,
Oxford,
Paxton,
Petersham,
Phillipston,
Princeton,
Royalston,
Rutland,
Saundersville,
Shrewsbury,
Southboro',
Southbridge,
South Gardner,
South Lancaster,
South Milford,
South Royalston,
Spencer,
Sterling,
Still River,
Sturbridge,
Stutton,
Templeton,
Upton,
Uxbridge,
Wachusett Village,
Warren,
Webster,
Westboro',
West Boylston,
West Brookfield,
West Fitchburgh.
West Milbury,
Westminster,
West Rutland,
West Sterling,
West Sutton,
Whitinsville,
Wilkinsonville,
Winchendon,
Worcester, (c. h.)

GEORGETOWN, D. C.—The reservoir of the water-works is 120 feet in diameter. It is covered with a brick dome, and when full, contains 1,800,000 gallons.

GAS FROM WOOD.

We extract the following correspondence from two consecutive numbers of the London *Engineer*. It may be interesting to some of our readers.

To the Editor of the *Engineer*:

SIR,—The *Engineer* of May 10th, 1861, p. 287, states that good gas has been made from pine wood for several years, in part of the Philadelphia gas-works. Can you, or any of your readers inform me if good illuminating gas can be made from pine wood alone, or does it require to be mixed with gas made from some other material? I should also feel obliged for a description of the necessary apparatus, or for the title of any work which treats on this subject.

I have for a number of years been using pine and also birch wood for making gas, and either do moderately well if mixed with gas made from other materials such as birch bark or tar; but I find that gas made from wood alone, gives very little light; this is probably owing to our apparatus (which is similar to that used for coal gas) not being suitable for wood.

A GAS-MAKER.

To which the editor of the *Engineer* replies:

All we know of the matter is, that wood gas is made in a retort divided longitudinally into two compartments, one over the other. The plan of the retort is the invention of Dr. Charles M. Cresson, of Philadelphia, U. S., and is, we presume, patented here in the name of some patent agent.

GAS FROM WOOD OR BARK.

To the Editor of the *Engineer*:

SIR,—To make good gas from wood or birch bark, there are two things to be attended to—the form of the retort and the treatment of the material used.

Dr. Cresson, of Philadelphia, uses a cellular retort, circular in form; but I have found diaphragm retorts, constructed in a peculiar manner, to answer very well, and which I have adopted for wood gas during many years past.

The wood or bark should be oven dried before being placed in the retort.

GEO. BOWER.

St. Neots Ironworks, July 2d, 1861.

GAS FROM WOOD.

To the Editor of the *Engineer*:

SIR,—Referring to the inquiries of your correspondent on this subject, I have a note from your impression of November 13th, 1857, which gives an account of a method of increasing the illuminating power of wood gas by passing it through tubes heated to a high temperature, whereby a large amount of carbonic acid is converted into carburetted hydrogen. Such gas was then used at the railway station, Munich, on account of its greater density than coal gas. Burners with a large orifice are recommended.

WILLIAM BAKER.

Lead Works, Sheffield.

[In Germany wood is extensively used as a material for making gas. The cities of Augusta and Macon, Ga., are lighted by gas made exclusively from pine wood. We have seen gas of the best quality and highest illuminating power made from pine wood in this city. The retort used was elliptical in shape, very wide, and only about eight inches in height, from top to bottom.—Ed. AM. GAS-LIGHT JOURNAL.]

SPONTANEOUS FIRES.—Masses of combustible material are most liable to take fire spontaneously under the following among other conditions:—When the weather is warm, and especially at the same time moist. When portions of the material are damp, or contain oil or grease, or other matters liable to decompose. When portions of the material are damaged, or partially decomposed. When portions of the material contain sulphur, phosphorus, saltpetre, or other substances capable of igniting at a low temperature. Combustible materials, when perfectly free from the above conditions, may be safely stored in large masses; but, as this very rarely happens, such masses are seldom safe during warm or damp weather.—*London Builder.*

NEW APPARATUS FOR NAPTHALIZING GAS.—M. Leveque, of Paris, France, has invented a new apparatus for carburetting or naphthalizing gas. By its peculiar construction, the hydro-carbon liquid is kept at a constant height in the apparatus.

ON THE MANUFACTURE OF OXYGEN AND HYDROGEN.

By MM. Sainte-Claire Deville and H. Debray.

[Abridged from the *Annales de Chimie et de Physique.*]

(*Concluded from page* 43.)

In other operations we obtained better results, as will be seen by the produce that we now report. We also carefully measured the coal used as fuel, in order subsequently to ascertain the cost price of the gas.

Giessen manganese		66 kilogrammes.
Oxygen produced	3024 litres.	
Oxygen remaining in the two last bottles, collected on the following day	386 "	
		3410 litres.
Coal consumed for the first 500 litres	68 kilogrammes.	
Coal consumed for the last 2524 litres	52 "	
		120 kilogrammes.
Maximum yield per hour		800 litres.
Oxygen produced per kilogramme		51.7 "
Coal consumed per cubic mètre by the first portion of the gas		136 kilogrammes.
Coal consumed per cubic m tre for the last portion of the gas		20.6 "
Average consumption of coal per cubic mètre		25.2 "

The consumption of coal remained the same in all our subsequent experiments.

The residual product of the manufacture of oxygen was sold to a chemical product manufacturer at the rate of 10 francs the 100 kilogrammes. It was intended for the use of glass manufacturers, who prefer it to crude manganese because it had lost 12 per cent. of its water and oxygen, which are either of no value or exercise a prejudicial influence in the preparation of glass.

The operation by itself is only sufficient to employ a workman when the furnace requires to be charged, without his being required to attend to any other part of the apparatus; so that we estimate that, with apparatus on a sufficiently large scale, one workman will easily manufacture 10 cubic mètres of oxygen in a day.

With these elements before us, we are able to calculate the cost price of the oxygen extracted from Giessen manganese on the following basis:

66 kilogrammes of manganese, at 27 francs the 100 kilogrammes at Paris	17 fr. 82 c.
Labor	1 19
Fuel	2 72
Wear and tear of apparatus, &c	0 50
Total	22 fr. 23 c.
Deduct the value of 58 kilogrammes of red manganese, at 10 francs per 100 kilogrammes	5 80
Cost of 3410 litres of oxygen	16 fr. 43 c.
Or, per cubic mètre	4 87

The cost from the other descriptions of manganese would be as follows:

	Cost of Manganese per 100 Kilogrammes.	Cost per Cubic Metre of Oxygen.
Romanèche	10 fr.	4 fr. 86 c.
Spanish	16	3 45
Pyrénées	18	3 86
Giessen	27	4 87
Piedmontese	40	5 93

For these calculations the following data have been taken, supported as they are by the experiments previously narrated:

Coal necessary for the decomposition of 100 kilogrammes of manganese	206 kilogrammes.
Labor per 100 kilogrammes of manganese	1 fr. 81 c.
Wear and tear of apparatus per 100 kilogrammes	0 fr. 75 c.

Chlorate of Potash.—Chlorate of potash yields 271 litres of oxygen per kilogramme. One of its inconveniences consists in the difficulty of its manipulation. By mixing it, however, before decomposing it, with once or twice its weight of manganese (which serves for an indefinite period, provided that it is washed after it has been used, which washing, besides, is indispensable for the recovery of the chloride of potassium, the value of which must not be neglected in calculating the cost of the oxygen), its decomposition may be effected with regularity, while all danger is avoided.

We have ascertained that chlorate of potash can yield at a low temperature the quantity of oxygen that it theoretically contains, and that the value of the chloride of potassium may almost cover the expense of manufacturing the gas and washing and evaporating the chloride of potassium. In spite of this, however, the cubic mètre of oxygen, prepared with this salt, costs nearly 10 francs. As chloride of potassium can only be transformed into chlorate of potash by means of chloride of lime, itself prepared by manganese, there is no hope that the oxygen prepared by this method can be preferred to the gas which is obtained directly from manganese; nevertheless, in consequence of the facility with which this preparation is made, we thought it necessary briefly to mention the result of our trials.

Chloride of Lime.—Chloride of lime, heated to a dull red, gives 40 or 50 litres of oxygen per kilogramme, mixed with a little chlorine, of which it may be deprived, either by adding a little slacked lime to the chloride, so as to render it strongly alkaline, or by washing the gas in an alkaline water. The first method would be the most economical, and would, besides, allow iron vessels to be used. Care must be taken to avoid a heat that would fuse the chloride of calcium which remains, a circumstance less likely to occur with a mixture of slacked lime and chloride of lime.

The cost price of this oxygen, not including the expenses of extraction, which are inconsiderable, would be, at least, four and a half times greater than the price of a kilogramme of chlorine, or about three francs 60 cents. The cubic mètre of gas would, therefore, cost about 5 francs. This mode of preparing oxygen from chloride of lime is very regular, and withal is not dangerous. We particularly recommend this process to chemists. The calcination of the chloride of lime may be effected in glass vessels. Before introducing it into the retort, it should be mixed with a little slacked lime, and the gas, before being collected, should be slightly washed in an alkaline lye.

Nitrate of Soda.—Berzelius quotes saltpetre as one of the substances from which oxygen is easily extracted. M. Balard has further remarked that the nitrite of soda, obtained as a product of the incomplete decomposition of nitrate of soda, may be as well and as economically employed as the nitrate in the production of nitrous vapors, which serve, in the sulphuric acid chambers, to fix the oxygen of the air on to the sulphurous acid, for the purpose of transforming this latter gas into sulphuric acid.

We therefore thought it necessary to experiment upon this substance only, for the purpose of informing ourselves as to the facility with which it can be treated, and to study the composition of the gases which result from its calcination at a low temperature. This heat ought to be such as to produce nitrogen gas in insignificant quantities only. The production of nitrous gas, which takes place at the commencement of the operation, is inevitable, but this gas, being soluble in water, may be collected and turned to advantage. As to the protoxide of nitrogen, its presence corresponds to a loss of nitrous acid abstracted from the soda, which becomes free, and of which the value is less than that of the nitrite, which must be preserved, at whatever cost or risk of leaving a considerable portion of nitrate in the residue still undecomposed. One kilogramme of the damp crude nitrate of soda of commerce, introduced into a mercury bottle, gave, when heated to a dull red of about 700°—

1st. Nitrous vapors.		
2d. Gas of a high combustion-supporting power		120 litres.
The composition of this gas was—		
Oxygen and a small quantity of protoxide of nitrogen	74.2 "	
Nitrogen	25.8 "	
	100.0 litres.	

The fire was withdrawn at the moment when the gases began to be very rich in nitrogen. The alkaline residue contained a great deal of nitrite and very little nitrate. The action on the retort was very slight. The operation takes place rapidly, from the moment when the decomposition commences, and great precautions are required if a large quantity of nitrate of soda is used.

Nitrate of Baryta.—Of course, we tried the process of M. Boussingault for the extraction of oxygen from the air by means of baryta. The beautiful experiments of M. Boussingault himself (see *Annales de Chimie et Physique*, 3d series, vol. xxxv) left little to do in a theoretical point of view. But we desired to find out the conditions under which the operation should be carried on on a large scale, and it will be seen that they are very simple.

Decomposition of Nitrate of Baryta.—The decomposition of nitrate of baryta produces nitrous vapors, protoxide of nitrogen, and oxygen. The resulting gas possesses strong combustion-supporting power, and may be used in the fusion of platinum, its calorific effects being almost in the proportion of its richness in oxygen. We took some melted nitrate of baryta, which we introduced into an earthenware retort placed in a furnace, and communicating with a large Liebig's bulb-tube of the capacity of three-quarters of a litre, which we had constructed out of small globes of the eighth of a litre, united together by tubes fused by the blow-pipe. This tube contained a soda lye, so concentrated as not to lose any trace of humidity by the passage of the gases, which themselves were dry, because we were operating upon melted nitrate of baryta in large fragments. The gases collected under bell-glasses, or, in a graduated gasholder, were measured at the pressure of the atmosphere.

In operating upon 200 kilogrammes of nitrate of baryta, we obtained 5.80 grammes of nitrous acid vapors and 47.55 litres of gas. The pressure of the atmosphere was 760 millimètres, and the temperature 24°; 114 grammes of baryta remained in the retort. The gas generated during the last stages of the distillation gave, on analysis—

Protoxide of nitrogen	1.6
Nitrogen	37.2
Oxygen	61.2
	100.0

The gas obtained by the whole operation gave on analysis—

Protoxide of nitrogen	1.0
Nitrogen	32.3
Oxygen	66.7
	103.0

It is clear, from this operation, that nitrate of baryta is entirely decomposed at a temperature of dull redness; that it gives in the form of nitrous vapors a quantity of acid capable of saturating 10 per cent. of the baryta which remains as residue; that it evolves combustion-supporting gases, which may be employed pure or mixed with oxygen for the fusion of platinum; and, lastly, that 1 kilogramme of nitrate of baryta gives 238 litres of these mixed gases, or 192 litres of oxygen, either pure or mixed only with protoxide of nitrogen. We would here remark that protoxide of nitrogen, according to the experiments of MM. Favre and Silbermann, gives out a greater heat during its combustion than would the oxygen it contains; its use, therefore, is probably quite as advantageous as that of pure oxygen.

Preparation of Binoxide of Barium.—We operated upon 5 kilogrammes of anhydrous baryta, which we introduced into a mercury bottle, pierced at its two extremities with holes, into which gun-barrel tubes were inserted. The air was conducted from a pair of bellows into the bottle, heated to redness by coke, and escaped by one of the gun-barrel tubes in such a manner that we could collect a certain portion for analysis.

We should here remark that good results cannot be obtained when considerable quantities of baryta are employed, and that it is absolutely necessary the baryta should be free from nitrate or nitrite, and, in general, from all fusible substances. In all our operations, which were conducted with the precautions indicated by M. Boussingault, we obtained on the large scale results certainly less advantageous than his, but still agreeing very nearly with those which may be found in his memoir. We were, however, obliged to apply to our apparatus a much greater heat, in consequence of the thickness of the stratum of substance employed; and were obliged to give up the use of air saturated with humidity to revivify the oxide of barium.

If the air contains much humidity (as considerable portions are passed through the apparatus), hydrate of baryta is formed; the caustic baryta becomes impregnated with it, loses its porosity, and, in the end, becomes pasty to such an extent that it cannot be extracted from the mercury bottles. With apparatus having a large surface, and containing a small quantity of the substance, similar accidents need not be apprehended, because the heat is necessarily less intense.

Under these conditions, the absorption of the oxygen of the air is less perfect; and, as a means of all our ex-

periments, we have deprived the dry air of a third of the oxygen it contained in saturating the baryta almost exactly. The quantity of dry air which it is necessary to pass through the apparatus for the intermittent production of the binoxide of barium and the manufacture of 50 cubic mètres of oxygen (this oxygen is very pure), would be about 700 cubic mètres, according to our experiments upon 5 kilogrammes of baryta. The apparatus itself would be very simple. It would be composed of four bottles, arranged and heated as those used for manganese. To operate with certainty, two furnaces and two complete systems of apparatus are necessary. The revivification of the binoxide takes a greater length of time, and requires more fuel than the decomposition of the same oxide when the furnace is working at a suitable temperature.

We should not have hesitated to employ this process for the preparation of the enormous quantity of oxygen we consumed in our experiments, and should not even have been deterred by the cost of the nitrate of baryta which is found in commerce, if it had not entailed upon us the necessity for expending a still larger sum in the apparatus destined for the decomposition of the nitrate of baryta. This is a very difficult operation; it requires the employment of cast-iron vessels of large capacity; and this question, which appears to us to be the only one requiring to be studied at the present time, would not perhaps have been solved in a laboratory like that of *L'Ecole Normale* so well as it would have been in a manufactory where there were thick cylinders of cast iron, such as are used in the manufacture of nitric acid. It is in vessels like these that the decomposition of nitrate of baryta should be effected. The baryta obtained in iron vessels is strongly blackened, but the quantity of oxide of iron corresponding to this intense discoloration is very small. With this difference, it resembles the baryta of our laboratories

Sulphate of Zinc.—The sulphate of zinc, produced in voltaic batteries, is a substance for which a use is now sought. Hitherto, no one has proposed to employ it as a source of oxygen, which it, nevertheless, furnishes with great facility, as is proved by the following experiments:

We took the sulphate of zinc of commerce, which we dried, and then introduced into an earthenware retort. The gas produced in the retort was carried through a small platinum tube, cooled by a current of water, into a sulphurous acid washer. Sulphurous acid, one of the products of the decomposition of the zinc salt, is there condensed, and the oxygen is conveyed through a meter into a graduated gasholder. The retort should be heated to a little brighter red than is required for the decomposition of manganese. At the end of the operation, there will be found a very light oxide of zinc, of a slightly yellow color, and which only contains traces of acid. A little water is distilled; and, at the end of the operation, a small quantity of fuming sulphuric acid is found in the platinum tube. The retort is perfectly intact after the operation, as the oxide of zinc combines with silica with very great difficulty. The temperature employed was not sufficiently strong to fuse the cinders of the furnace. We estimate it at about that of the fusing-point of silver—that is to say, a bright red.

The following are the results of these operations:

Crystallized commercial sulphate of zinc	1000	grammes.
Dried at a temperature of 209° or 300° (it still contained about 3¼ per cent. of water)	582	"
Oxide of zinc remaining	587	"
Of this oxide of zinc there was taken	100	"
Which, on being washed, left dissolved, sulphate of zinc	0.70	"
From this the oxygen obtained was	38	litres.
The calculated yield of oxygen was	38.7	"
Loss in oxygen, per cent	0.2	"

The residue consisted of—

Oxide of zinc	99.3
Sulphate of zinc	0.7
	100.0

We thought that, by adding pounded clay to crystallized sulphate of zinc, and making a mixture which liquified at 100°, and became very closely blended, on drying we should have obtained better results; or, rather, that we might have lowered the temperature at which the decomposition took place considerably. That it was not so, will be seen by the following experiments:

1.—Crystallized sulphate of zinc	1000	grammes.
Clay	300	"
The dried mixture	905	"
Oxygen obtained	35.7	litres.
Residue of clay and oxide of zinc	551	grammes.
Undecomposed sulphate of zinc	4	per cent.
Loss in oxygen	7.9	"
Sulphuric acid condensed	3.9	"
2.—Crystallized sulphate of zinc	1000	grammes.
Clay	680	"
The dried mixture	1150	"
Sulphate of zinc which escaped decomposition	7.4	per cent.

With sand, we obtained still more unfavorable results. By heating two parts of dried sulphate of zinc and one part of siliceous sand to a red heat, we only decomposed 64 per cent. of the sulphate of zinc, and very little silicate of zinc was formed. Thus, according to our experiments, 100 kilogrammes of the anhydrous sulphate of zinc will give 6.8 cubic metres of oxygen, which is considerably more than the best manganese of commerce, leaving a useful residue (for paint or for the manufacture of zinc) of 51 kilogrammes of oxide of zinc, and producing 22 kilogrammes of sulphurous acid, for which a use may be found in the manner hereafter stated.

Sulphuric Acid.—Sulphuric acid has the property of being completely decomposed at a nascent red heat, into sulphurous acid and oxygen. Sulphurous acid is very frequently employed in the arts, either in the state of a saturated aqueous solution, or as sulphite of soda, or as the hyposulphite of soda, which is obtained by means of sulphite of soda and sulphur. For all these uses sulphurous acid, pure and free from nitrogen, is obtained through the decomposition of sulphuric acid by a reducing body. It was, therefore, natural to endeavor to produce sulphurous acid, making use at the same time of the oxygen.

After reflecting well upon the subject, we saw that as oxygen produced from manganese was so costly, that we might obtain the gas profitably by the decomposition of sulphuric acid, even when losing the sulphurous acid. In reality sulphuric acid of 60° (specific gravity 1.69), produced from pyrites, costs only 5 or 6 francs the 100 kilogrammes, and as these 100 kilogrammes contain 64 kilogrammes of anhydrous acid, producing 13 kilogrammes or 9 cubic mètres of oxygen, it follows that the oxygen taken from the sulphuric acid costs scarcely 66 centimes the cubic mètre ($3.50 per 1000 cubic feet), which is much less than from any other known substance, except, perhaps sulphate of zinc. Beside this, the equivalent of sulphurous acid in the sulphites and hyposulphites having a much higher value than the equivalent of anhydrous sulphuric acid of 60°, it may be conceived how an industry which uses pure oxygen may produce sulphurous gas as one of the residual products of its manufacture.

These reflections induce us to recommend manufacturers who can improve their productions by employing oxygen, to consider this gas for the future as being within their reach, by the ease with which it is obtained and, above all, by the price of its equivalent, which is, 6.3 times less than that of chlorine, this gas being worth 66 centimes the kilogramme.

$$\left(\frac{8}{3\,5}\cdot\frac{5}{3}\times 1\cdot 4\,3 - \frac{1}{6}\cdot\frac{5}{3}\right)$$

It is clear that, if we could borrow oxygen directly from the air, it would become an article of daily use. For artificial illumination in particular it might be most beneficially employed to obtain a very brilliant light. At Messrs. Rosseau Brothers' manufactory of chemical products in Paris, we have seen powerful lamps burning which were fed by oxygen gas, the cost of which was inconsiderable in comparison with their illuminating power. This gas, nevertheless, was manufactured on a small scale in their own works from manganese, and did not cost less than 10 francs the cubic metre, at which price it was sold in India rubber bags.

The great specific gravity of oxygen in comparison with lighting gas, the facility with which it may be confined within a receiver similar to those in use for portable gas, and its perfect harmlessness, will, we hope, lead to experiments such as our labors have shown to be possible.

The following is the result of one of our experiments:—

Specific gravity of acid used	1.825
Volume of acid	1.65 litres.
Weight of acid	3.1 kilogrammes.
Oxygen produced	300 litres.
Oxygen which should have been produced, had the decomposition been complete	314 "
Acid undecomposed	4½ per cent.
Composition of the original acid—	
Anhydrous acid	2.26 kilogrammes.
Water	0.75 "
	3.01 "

	Kilogrammes.	Per Cent.
Anhydrous acid which escaped decomposition	0.102	11.9
Water of the original acid	0.750	88.1
Weak acid collected	0.852	100.0

of which the specific gravity was 1.10, and the strength 17°.5 Baumé.

Another experiment, made the same day, in the same time, and with a greater speed, gave us less favorable results:

Acid used	4.31 kilogrammes.
Oxygen obtained	400 litres.
Oxygen which should have been obtained, had the decomposition been complete	452 "
Acid undecomposed	11½ per cent.
Composition of the acid collected—	
Anhydrous acid	27.4
Water	72.6
	100.0

the specific gravity being 1.25.

There is, therefore, a certain speed, according to the size of each apparatus, which must not be exceeded if the best possible results are desired.

With regard to the cost of this oxygen, it should be calculated according to the price of sulphuric acid.* In allowing 7 or 8 kilogrammes of coke or coal as fuel for each cubic mètre of gas, we shall obtain a maximum which will not give more than one franc per cubic metre (22s. 3d. per 1000 cubic feet) as the cost of the gas, labor included.

HYDROGEN.

[The hydrogen used in the course of the experiments was produced by the decomposition of water in retorts filled with coke, and heated to a high temperature in the usual manner adopted in this country for the manufacture of "water gas." When produced at the rate of 304 litres an hour, the composition of the gas was as follows:

Hydrogen	53.3
Carbonic acid	6.5
Carbonic oxide	40.2
	100.0

When produced at the rate of only 240 litres an hour, the composition of the gas was:

Hydrogen	52.5
Carbonic acid	5.0
Carbonic oxide	42.5
	100.0

It is stated that gas of this description, used in the manufactory of M. Christofle, cost 3s. 4d. per 1000 feet.]

* Anhydrous sulphuric acid gives one-fifth of its weight of oxygen, or 14.760 cubic mètres per 100 kilogrammes. Chamber acid of 54° contains 50 per cent. of anhydrous acid.

Paraffine Oils for Lubricating and Cartridges.—In the patent of James Young—the first one obtained for the manufacture of coal oils—he calls such coal products "paraffine oils." Perhaps this is really the best name which can be applied to the heavy oils so obained, as they contain a great quantity of paraffine, This peculiar substance is derived from the refined coal oils, by freezing them with ice, then submitting them to severe pressure in bags. The paraffine is thus obtained in cakes, and, when bleached, is a most beautiful white substance, resembling spermaceti.

Paraffine is almost unalterable in its character in contact with the atmosphere; hence it is perhaps the best substance which can be used to protect the surfaces of polished steel and iron. Paraffine oils may be retained in contact with polished iron without causing it to tarnish. In the machines employed at Woolwich, Eng., for making bullets for Enfield rifles, by compression, out of solid bars of lead, paraffine oil is exclusively used for lubrication of the dies, because it produces no chemical action upon the lead.

A patent has lately been taken out in England for the use of paraffine as a lubricating agent for army cartridges. The inventor states that the heat of the ignited powder completely volatilizes the paraffine, and it leaves no residue in the barrel of the rifle — *Scientific American.*

NEW SOURCES OF ARTIFICIAL LIGHT.

BY S. D. TILLMAN.

(*Read before the American Photographical Society, June* 10, 1861.)

The history of Technology does not contain a more striking illustration of rapid progress than is now being exhibited in the introduction of new means of illumination. Twenty-five years ago, coal gas, whale oil, and tallow, were the principal sources of supply; the former being furnished only to residents in our large cities. The vast majority of the people who reside in the smaller towns, or cultivate the soil, depending mainly upon the other named sources, found them gradually increasing in price as they were wanted as lubricators upon our vastly extended railroads, and in our rapidly increasing manufactories.

The introduction and use of lard oil, purified turpentine, and a mixture of camphene and alcohol, seems to have kept pace with the demand for more light, so that the prices of the first illuminating materials have now permanently advanced. Yet the danger constantly attending the use of the products of resinous distillation which were, until lately, the cheapest sources of light, and the number of lives annually sacrificed by a careless handling of them, are unanswerable arguments in favor of laws forbidding their use altogether. Happily, however, for the people, legal restrictions need not be resorted to, since new and cheaper sources of light have been recently found.

In this country, within five years, a vast supply of illuminating oil has been produced by the distillation of cannel coal; yet even this cheap and brilliant light seems destined to be superseded, for a time at least, by the natural oil or petroleum, which, within the last two years, has increased in quantity almost beyond belief. The first petroleum appeared in an artesian well, sunk in a search for salt water. The popular excitement which followed this discovery has never, perhaps, been equalled. But a few weeks elapsed before the borers for oil could be counted by thousands; so great was the rush to the successful locations, that accommodations could not be furnished to the army of adventurers.

The most prolific well, thus far known, is the Llewellyn, situated on the little Kanawa river, in the State of Virginia, about thirty miles above Parkersburgh; for six weeks the average flow was from eight to ten hundred barrels per day; it has since ceased flowing, and only from two to four barrels per day are now pumped from it. A large number of wells, which yielded immense quantities at first, have, in like manner, ceased to flow.

Without including those which have ceased to yield oil, the whole number of wells in operation, and in the process of boring, is estimated by a gentleman who has just returned from a visit to the principal wells in Ohio, Pennsylvania, and Virginia, at 4,500. Of this number about 1,500 are completed, and yield an average of five barrels, making the sum total 7,500 barrels as the daily yield. The supply, during the summer season, is far beyond the demand; and the result is, now, a fall in the price of crude oil, in the city of New York, to an average of eighteen cents per gallon, the price at the wells being not over ten cents per gallon. This crude oil, subjected to one distillation, yields about eighty per cent. of burning oil, which now sells in this city at from fifty-five to sixty-five cents per gallon. The quality of this oil, however, differs materially from that made from the distillation of cannel coal; owing to the large amount of volatile matter, in proportion to the paraffine, the oil produced is often explosive, and must be regarded as quite as dangerous as the products of the distillation of resin.

The variation in the specific gravity of well-oils ranges from 44° (according to the scale of Baume), which is the lightest, to 28°, which is the heaviest, and is extremely rare. Neither of these extremes are good oils for burning: the light oil contains too much volatile matter, and the heavy affords but a feeble flame. The oils sold for illumination in this market range from 36° to 40°, Baume; that having the specific gravity of 38° being considered the best.

About forty miles below Pittsburgh, at Smith's ferry, on the Ohio river, are situated three remarkable wells, yielding nearly pure oil, having a pale straw color, and being almost free from odor. Two of these wells produce about 112 barrels each. They are only 200 feet apart, yet the lower yields a heavy oil, having a density of 29°, Baume; the other, situated on the hillside, has a density of 42°, and is very explosive. Both oils have the same light color, and are only distinguished by their density.

These wells lead, undoubtedly, into the same reservoir in which the oils have ranged themselves in strata, according to their density. The products of the wells is not distilled, but is sold in its natural state for lubricating purposes. The heaviest oil commands, readily, the price of fifty cents per gallon, delivered at the well.

The first oil-well was sunk near Oil Creek, twelve miles below Titusville, Warren Co., Pennsylvania. This creek, which empties into the Alleghany river, derives its name from the fact that the Indians, at an early day, discovered oil upon its waters during the the warmest season, which was gathered by means of blankets. It has long been highly prized as a medicinal agent, and is generally known throughout the country as "Seneca Oil." On this creek, within an area of fourteen miles in length, by three in breadth, there are now about 1,700 wells. In the vicinity of Tidioute, eighteen miles from Titusville, on the Alleghany river, the wells completed, and in the process of completion, number about 350. From nearly all, the oil is raised by means of pumps—of three flowing wells, at Tidioute, one produced 300 barrels per day, another from 27 to 30, and another from 10 to 15.

Some idea of the ephemeral flow of oil-wells may be formed by the statement of a single fact. In July, 1860, at Franklin, in Venango Co., Pennsylvania, at the mouth of French creek, about 150 wells were in operation, yielding not less than 450 barrels per day; now, only four are being pumped, which, together, yield about 15 barrels.

It is, in the opinion of Dr. Stevens, geologist, that coal-oil originated in the bituminous shales of the Devonian series of rocks in Canada, Ohio, northwestern Pennsylvania; and in the carboniferous series, in southwestern Pennsylvania, and northwestern Virginia. The oil, undoubtedly, exists in reservoirs, which, when tapped, at first flows out with great force and rapidity, then gradually decreases until finally it can only be obtained by pumping, the supply being then limited to the daily production exuding from the shales.

Of the exact chemical constituents of these I cannot speak with certainty—very few have been subjected to complete analysis. It may be remarked, however, that these rock-oils, as well as the oil from cannel coal, contain more carbon than pure whale-oil, and less than rosin-oil or turpentine. The former belongs to the even-atomed series, embracing olefiant-gas, consisting of four atoms of carbon to four of hydrogen, oil-gas eight to eight, and spermaceti thirty-two to thirty-two. In the other series derived from the resins, the atoms of carbon and hydrogen are as five to four—it is said that petroleum is composed of six of carbon to five of hydrogen—its density depending upon the doubling of these atoms, as is seen in the olefiant gas series.

For brilliancy and illuminating power, coal-oil stands unrivalled; a gallon, costing fifty cents, is said to furnish more light than two gallons of the best sperm oil. A gentleman acquaintance, who uses it for microscopic purposes, pronounces it better than the light of the day. For all scientific uses this light now stands at the head of artificial illuminators. The introduction of rock-oil, and coal-oil, may be considered as marking a new era, in which millions of dollars are to be saved, and light of the best quality is to be furnished to the poor as well as the rich.—*Amer. Jour. of Photography.*

DRINKING FOUNTAINS.—Our English exchanges continue to notice the erection of new drinking fountains. They are generally very ornamental in design, and substantially built. Some of our cities have introduced hydrants for drinking purposes, which are inserted into gas-light posts at the corners of the streets. They occupy no additional space upon the sidewalk, and are operated by placing the foot upon a treadle, so that a child has no difficulty in using them. They are so arranged, also, as to be beyond the reach of frost.

PURIFICATION OF WATER.

In melting nitre with black oxide of manganese, a substance known as "chamelion mineral" is formed, in other words, a manganate or permanganate of potash. Dissolved in hot water, this substance changes, in decomposition, to a variety of hues, some of which are of great brilliancy. After mixing a few drops of the solution, at a violet-rose or Magenta color, with ordinary well or river water, the latter, after a greater or less interval (as, perhaps, in a few minutes, or, in other cases, after some hours), becomes of a dull yellow cast. This unprepossessing opacity is the visible disclosure of organic impurity in the water—the same kind of impurity as that which, when cholera raged in London, lurked as poison in the deadly waters of the well in Broad street, Golden square, and which still abounds in nearly all, if not all, the surface wells of large towns. Once a month may generally be found, in a column of the *Times*, a table of analyses of metropolitan waters, by that accomplished chemist, Dr. Robert Dundas Thomson, of St. Thomas' Hospital. The extremes of purity and impurity are tabulated at the top—*aqua pura*, and the foul discharge of a certain pump at Camberwell. The Loch Katrine water, with which the people of Glasgow are now blest, also occupies a line in the list, its organic matter being about six-tenths of one grain in a gallon, or one part in more than one hundred thousand. The Manchester water supply is nearly as pure. But of the liquid poison of the Camberwell sink, nearly eleven grains in a gallon are organic matter in solution, which, of course, is exclusive of whatever quantity may be held in mechanical suspension. This proportion of poison probably exceeds that contained in London surface wells generally, of whose contents Dr. Letheby has observed that "the man who habitually makes use of a London pump water, is living in perpetual danger of disease." But, then, it will be asked, do not all drinking waters contain poison? Perhaps so, but where the quantity is exceedingly minute there is little or no danger, unless in the case of lead, which is an "accumulative" poison, the most minute quantities taken into the system being retained until enough has been stored up to cause disease, and, possibly, death. A water, however, containing three or four grains of organic matter per gallon, is unfit for drinking; while the water of sewers (apart from suspended impurities) seldom contains much above five or six grains of organic matter per gallon. The Thames did not, probably, hold three grains of organic matter per gallon, when, in 1852, the water companies drawing from the river were compelled by Act of Parliament to fix their pumps above Teddington lock. Even now, however, and with all that kind of filtering which Mr. Simpson made so popular among water companies, there are waters pumped into the metropolitan mains containing nearly two grains of organic matter in the gallon. It is but fair, at the same time, to say that with regard to this particular kind of impurity, the West Middlesex water is nearly as pure as that of Loch Katrine, and the New River water hardly less so. The tests, however, of these and other waters vary considerably, according to the state of the weather and the condition of the filter-beds. The latter—which will sometimes work for several weeks together—choke, now and then, in eight-and-forty hours. The green deposit—not to say slime—with which they become clogged, consists mostly of diatomaceous matter, liable to putrescent decomposition. These filter-beds, of which a single company—the East London—have twelve acres, remove a great deal of hurtful matter, no doubt, and it is in the state in which the water leaves them that Dr. Thomson analyzes its composition. But whatever may be the quality of the element supplied by the turncock fraternity, it is liable to unexpected contamination in our own houses. How many of us have ever explored the cistern, from which we are so ready to draw a sparkling draught in the heat of summer, and in the contents of which, our tea and coffee are daily infused? Whatever might be the effect upon our nerves, it would be as well, as a matter of sanitary precaution, to visit this reservoir, almost inaccessible as it generally is. The water should be drawn off to the last drop. If the deposits at the bottom do not form the most agreeable subjects for investigation, they had best, at all events, be collected and removed, and the

cistern cleansed without delay. Mud and dirt are likely to be found, enriched generally with decomposing animal matter, such as microscopical insects, cobwebs, &c., not to say, now and then, a mouse, or even a rat, in a state of partial solution! Without entering farther upon a subject so uninviting, we may say that many cisterns, on being opened for examination, are found to give off almost overpowering exhalations, and a chemical acquaintance of ours has actually discovered ten grains of organic matter in a gallon of water, from a cistern supplied by one of the great metropolitan companies, this water being simply a liquid slow poison.

So much for organic matter, popularly overlooked, or regarded as of little consequence as an ingredient of drinking water. Lead is the common bugbear of water-drinkers, and from the manner in which it stores itself up insensibly in the system, awaiting an accumulation which shall, in its sudden outbreak, prostrate the unsuspecting victim, this dread has a seeming foundation. But so far as our calcareous London waters are concerned (and they all hold lime in solution), lead is altogether harmless. Pour a few drops of acetate of lead into rain or distilled water and it will remain as transparent as before, poisonous as the mixture may be. Pour the same lead into London water and it will be precipitated in a cloudy deposit upon the bottom of the containing vessel, and there would really be no danger in drinking the water after it had again become clear. Not that we recommend the materials of a chemical experiment to be utilized in this manner. The one-fortieth part of a grain of lead in a gallon of water is said to be dangerous, and although an active imagination might, upon this fact, greatly disturb the personal comfort of the possessor, Becquerel could hardly have obtained data for his work on lead diseases in a community where lead was absorbed only from "hard" water.

As for lime which, either as a carbonate or sulphate, exists in solution in most waters, no one has argued any danger from it, unless in hazarding the conjecture that it tends to form urinary concretions. Apprehension on this score has, probably, never been generally aroused, but there is no doubt that hard waters involve the use of much greater quantities of soap in washing, than do soft or pure waters. So in making tea, twice the weight of the fragrant herb being requisite for a satisfactory infusion when the most obdurate water is employed, as compared with that required when the tea-kettle is filled from a source from which lime is excluded. The saving of soap and tea by the 450,000 inhabitants of Glasgow, as compared with the quantities consumed when the water supply was obtained from the Clyde, is said to cover the interest on the Loch Katrine works. We do not doubt it, the waters which lave the foot of Ben Lomond containing but 2½ grains of total impurity per gallon.

As, however, we cannot hope to exclude the common impurities of water from the ordinary sources of supply, some intercepting apparatus becomes necessary at the points of delivery. The water companies, to be sure, provide from three to six feet in depth of porous media in their filter-beds, but we have already gone over the insufficiency of what may be called distant as opposed to domiciliary filtration. What might be nectar at Thames Ditton, might become a deadly draught before being discharged from a kitchen tap at Brompton. Only pure animal charcoal, more commonly known as bone-black, is fit for the general and consequential purposes of filtration. Ten pounds of this substance, in its ordinary loose, granular state, will purify all the water required by an average London household for a year. Enclosed in a plain case, the water made to pass through it will retain scarcely a trace of organic matter, a large part of its lime will be intercepted, and all suspended impurities, of whatever kind, will be effectually excluded. Drs. Lankester, Letheby, and Thomson, have, as is well known, recommended animal charcoal in preference to all other filtering media, a preference which no chemist can for a moment oppose. Mr. Danchell, of Red Lion square, who has, perhaps, paid more attention to the philosophy and practice of filtration than almost any man in the kingdom, has, after bringing out the "moulded carbon" and other filters, adopted purified animal charcoal exclusively for the construction of his present instruments. He has found that the attempt to strain the water, or, in other words, to intercept soluble impurities by the fineness of the filtering media, is certain to lead to choking, which is precisely the mode in which his moulded carbon filters (still, we believe, in the market) failed. The loose granular bone-black, on the contrary, does not act mechanically, except on the coarser impurities, but attracts and accumulates dissolved matter, whether organic or mineral, by affinity alone. Ordinary cistern water thus filtered becomes very pure, so pure, indeed, that in much of the *aqua pura* sold by the chemists, a greater amount of organic matter (absorbed from the air where the distilled water has been openly exposed to it) may be found. Through any compact filtering medium the water percolates feebly, while through the loose open substance of bone-black (which in itself imparts no color to the water) a free and steady flow is maintained.

The water expressed from a sponge, after it had been dipped in a stagnant pool, or even in the ordinary contents of a river, would not be generally preferred for drinking. Yet of the few filters in common use a majority, probably, consist each of a piece of sponge packed in a case, and beneath a small quantity of gravel and fine sand. The inefficiency of such a contrivance, if not apparent from reflection, may easily be shown by testing the water passed through it for organic matter, lime, &c. Without the trouble of a quantitative analysis, the early tendency to opacity, on the addition of a few drops of a solution of permanganate of potash, will sufficiently show how far such water can be said to have been "filtered." Its brightness, or pellucid appearance, goes for nothing, or at least only to prove the exclusion of suspended impurities, otherwise visible to the eye. The worst surface well waters of London are not only the brightest, but the coolest, and in all respects the most attractive to the eye of a thirsty man. The poisonous proportion of dissolved organism is beyond the reach of even the microscope, the carbonic acid generated in its decomposition imparts briskness, and the dangerous nitrates a grateful coolness. All these noxious matters will pass freely with the water through a sponge filter, and without particularizing the familiar names of the makers of such instruments, we may urge the necessity of buying and using only such filters as are known to be made of purified animal charcoal. These filters, we are glad to learn, are coming rapidly into use.

A knowledge of the properties of the "water we drink" is, we believe, of the utmost consequence to every human being. Ordinary people, to whom chemical investigation is incomprehensible, are, happily, much disposed to credit its results. But to obtain analyses of two or three varieties of water, from a professional man, would be a matter of considerable expense. Those who have read Dr. Lankester's work "On Food," will preceive too. that quantitative analysis of water is not essential in order to decide whether it is or is not fit for drinking. We may mention, therefore, that Mr. Danchell has arranged a convenient little pocket-case of the most important tests, with the aid of which, and the accompanying instructions, any one may determine for himself, the qualities of the water supplied for his daily use. There are, we hope, not many who, on making such a test for themselves, would long delay to procure a filter, for most assuredly, taking London waters as they average, and, for that matter, nine-tenths of all the drinking waters in the kingdom, they greatly need purification. Apart from the vital consideration of health, the saving of soap and of many articles of food would, in every household now using hard water, repay twice over, every year, the utmost cost of filtration.—*London Engineer.*

Local Decomposition in Lead Aqueduct Pipes.—Mr. J R. Nichols, of Boston, calls attention to a source of danger attending the use of leaden pipes used for the conveyance of drinking water, which seems to have been hitherto disregarded. Even if it be admitted that the water which is supplied to the city of Boston from Lake Cochituate, like that of most New England ponds, be such that it may be safely used after having passed through lead pipe under ordinary circumstances, it would, nevertheless, be wrong to infer that this water can be employed with entire safety at all points of delivery, without first inquiring whether special conditions may not exist in some localities by which the character of the water may there be changed. Having observed several instances in which the inmates of a single house had suffered from lead disease induced by the use of aqueduct water, while the inhabitants of other parts of the city supplied with water from the same original source were unaffected, and having, in one instance, detected the presence of considerable quantities of lead in one of the cases first mentioned, while no reaction for lead could be obtained from a specimen of the same aqueduct water taken from another locality, the author proceeded to inquire into the cause which produces this lead impregnation in certain houses or districts while the general waters of a supply remain unaffected. He has noticed in the leaden pipes removed from cess-pools, sinks and wells, that the intensity of corrosive action had been in great measure confined to the sharpest bends and depressions in the pipe, while in some instances other portions remained intact. "I have in my possession," he says, "a section of supply pipe, removed from the aqueduct of a neighboring city, in a portion of which corrosive action had proceeded so far as to cause leakage. The part thus acted upon was confined to an acute angle, and there is evidence to show that the plumber, in placing it in possition, bent it in the wrong direction, thus creating the necessity for another turn in the opposite. This pipe had doubtless been subjected to two violent turns, which seriously impaired the homogeneity of the metal. An examination of lead pipe removed from buildings will certainly show that where there has been any perceptible amount of decomposition, it has been confined to the angles and depressions in its course. There are three causes or agencies which may perhaps be sufficient to produce these results:—1. The disturbance in the crystalline structure of the metal by bending, whereby its electrical condition is changed and voltaic action promoted, giving rise to chemical decomposition. 2. The presence of organic matter, such as fragments of leaves, and impurities pervading all pond waters, and which may be detained in angles and depressions of the pipes. Their presence, undoubtedly, promotes oxydation [?] and the protoxyd of lead will remain in solution, unless sufficient carbonic acid is furnished to change it. It is easy to conceive of conditions where this could not be the case. 3. Corrosions may be produced in lead pipes by the accidental presence of pieces of mortar. Where mortar is present, the lime would assist in oxydizing the metal, and also aid in the solution of the oxyd. Considerable portions of fresh mortar are frequently deposited in lead pipes, during the erection of buildings. When the family commence the use of the water, it holds the salts of lead in solution, and its presence may be detected for months. The process of oxydation, which is retarded or prevented altogether by the presence of neutral salts in water, could not be materially interfered with under the conditions considered. It is obvious, if these observations and conclusions are correct, that much care should be exercised in placing pipes in position in buildings. In those leading to the culinary department, angles and depressions should be avoided. Violent twists and turns should not be permitted, and during the erection of houses, the open ends of protruding pipes should be carefully closed. Assuming the general fact that lead pipes, conveying the waters of our New England ponds, become coated and protected by an insoluble lead salt, the question arises, how long before this protection is secured, or, how soon may a family commence the use of water passing through new pipes, with safety? In view of the manifest danger from local disturbanbes, the most sensible reply would be, *never*. A section of new lead pipe immersed in Cochitute water one hour, at a temperature of 65° F., gave a decided lead reaction with sulphydric acid. Removed and placed in six fresh portions of water one hour in each, the waters, when tested, gave similar results. The experiment continued during two weeks. Varying the time of immersion in fresh portions of water from one to ten hours, the lead indications continued, although at last feeble. These results are sufficient to show that individuals or families should not commence the use of water flowing through new pipes, until considerable time has elapsed, and much water contact secured.—*Boston Medical and Surgical Journal.*

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THE

AMERICAN GAS-LIGHT JOURNAL,

PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

PROPRIETOR, JOHN B. MURRAY. | EDITOR, C. ELTON BUCK.

THURSDAY, AUGUST 15, 1861.

Notwithstanding the progressive ideas characteristic of the present day, and the spirit of candid inquiry with which important questions are discussed, we still find occasional examples of a determined aversion to improvements, and an affected conservatism which might try the patience of even Job himself. An instance of this kind has lately occurred in London, the place of all others where should be found the most intelligent opinions on the subject of the harmlessness and utility of gas. The trustees of the famous British Museum have been, for some time, agitating the question as to the propriety of introducing lights in the museum, and throwing open the exhibition to the public after dark, so that those whose business precluded their attendance during the day, might avail themselves of a visit during a few hours in the evenings, and thus receive an amount of instruction and entertainment, from which they would be otherwise deprived. The propriety of this step must force itself upon the minds of all, and evinces a laudable disposition on the part of the trustees for having suggested it. As a matter of course, our readers will suppose gas to have been selected as the illuminating agent; but here they will be disappointed. The officials of the establishment have consulted Mr. BRAIDWOOD, the superintendent of the London fire department, as to the safety of lighting the museum. This gentleman reported that the building might be lighted with candles, or oil, with comparative safety, but that if gas were to be used as the illuminating agent, "the question assumes a very different aspect."

An opinion of this kind, deliberately uttered in this nineteenth century, and by an official, too, of whom more enlightened views might have been reasonably expected, is indeed an anomaly. But the reasons which the gentleman gives to bolster up his opinions are still more inexcusable, and evince a remarkable aptitude for sophistry, seldom to be met with. He declares that gas "dessicates everything within its reach, rendering the ceilings, &c., more inflammable than they would otherwise be," and that "the heat and fumes evolved by the combustion of gas, are most decidedly against the preservation of any vegetable or animal substances, and tend to discolor stone, marble, &c."

But, facts enough have been adduced by candid observers of the effect of gas-lights to prove the falsity of Mr. BRAIDWOOD's opinions. Gas has been proved to be not only the safest, but the cheapest, most cleanly, and least injurious illuminating agent known, and so far from unduly "dessicating" the ceilings, or parts of a building in proximity to it, it generates far less heat during combustion than any other known illuminator, in proportion to the quantity of light emitted. This is not a mere assertion, nor is it made on the authority of an unknown tyro, but is borne out by accurate experiments, and established beyond dispute.

As to the sense of danger in the use of coal-gas, which Mr. BRAIDWOOD wishes to impress, that is soon disposed of. The testimony of LEWIS THOMPSON, Esq., is so clear upon this point that a quotation from his admirable essay* on the nature and properties of coal-gas, will exhibit its fallacy.

"It fortunately happens, however, that, from the progress of collateral knowledge, the first of these objections [i. e. danger] has long ago received a conclusive answer through the experience and practice of our insurance companies, who are now so perfectly convinced of the safety of gas that they neither make an extra charge, nor require any notice or intimation whatever upon its adoption as a luminiferous or calorific agent in place of lamps, candles, or coals. Here, then, we have the best of tests—the money test, the test of self-interest—a kind of evidence which it is impossible to controvert, coming, as it does, from a class of the community not very liable to be deceived in such matters; and this test so powerfully demonstrates the entire safety of coal-gas, that I will henceforth dismiss it without the ceremony of a discussion. No man of common sense now-a-days, in fact, believes that there is any real danger in the use of coal-gas."

The comparative "dessicating" influence of gas can be as summarily disposed of, and in so doing we will adduce facts, sustained by figures, to prove the position of Mr BRAIDWOOD to be utterly untenable. We know that the opinion generally prevails that gas emits more heat in burning than other illuminators; but, in forming this opinion, the relative intensity of the light is overlooked. A five-foot fish-tail burner gives a light equal to about 15 sperm candles, yet who would deny but that 15 candles give out more heat than a single gas-burner? In forming a judgment as to the comparative amount of heat generated during the combustion of different illuminators, a photometrical standard should be adopted, for this is the only means of arriving at a just conclusion. Mr. THOMPSON instituted a series of experiments for the purpose of ascertaining the relative calorific power of different illuminating agents, based upon a photometrical standard, in which the figures obtained exhibit the number of grains of water raised from 60° to 212°, Fahrenheit, by each substance used. In these experiments,

Cannel gas raised	4,074	grs.	of water	152° F.
Common gas "	6,840	"	"	"
Sperm candle "	7,305	"	"	"
Tallow mould candle "	7,534	"	"	"
Colza oil "	7,870	"	"	"

These figures speak for themselves, and show that for equal amounts of light, gas produces much less heat during combustion than any of the other agents used, and, at a glance, prove the fallacy of such *ad captandam* statements as have been uttered by Mr. BRAIDWOOD.

The assertion of the same gentleman, that the "fumes evolved by the combustion of gas, are most decidedly against the preservation of any vegetable or animal substance, and tend to discolor stone, marble, &c.," needs but a plain statement of facts to show its total falsity, and place it in the same category with the other equally untrue conclusions arrived at in the official opinion of this *savan*. Mr. BRAIDWOOD evidently belongs to the BOWDITCH and LETHEBY school of philosophers, who trace countless evils to the presence of the minute quantity of sulphur in coal-gas, and who continue to dilate upon the imaginary calamities apprehended from that source with a gravity ludicrous to behold. The experiments of Mr. THOMPSON, already alluded to, prove that coal-gas, during its combustion, produces less noxious impurities than any other agents ordinarily employed for artificial illumination; and the opinion of Messrs. LEESON and WARRINGTON, in their paper on the salubrity of the use of coal-gas, are still more confirmatory of the harmlessness of the vapors generated during its combustion. Other authorities might be adduced to prove this fact; but it must be so palpable to all who will take the trouble to examine it, that further comment is unnecessary.

We have not heard of the ultimate decision of the trustees of the British museum, but hope they will not let such misguided views as those of Mr. BRAIDWOOD, deter them from so commendable an action as opening their matchless collection to the public of evenings. If any danger from fire be apprehended, let wise precautions be adopted, and extra watchfulness be maintained. Let the gas be introduced with proper pipes, fixtures, and burners, and if managed with ordinary care, no cause for alarm need be felt, either from fire, "fumes," or "dessication"—Mr. BRAIDWOOD's opinion to the contrary notwithstanding.

Since writing the above, we have learned of Mr. BRAIDWOOD's untimely fate. He was killed by the falling of the ruins at the recent great fire in London. While disclaiming any intentions of unkindness to him, in the foregoing remarks, we deem it our duty, in an independent manner, to controvert opinions fraught with such inconsistency, and to expose their weakness, lest they should be received with an undue attention as coming from an official source.

* On the Nature and Chemical Properties of Coal Gas; considered with respect to its economical and sanitary application for the purposes of Generating Light and Heat. By Lewis Thompson, Esq., M. R. C. S., &c.

NOTICE TO SUBSCRIBERS IN GREAT BRITAIN.

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TO PHILADELPHIA ADVERTISERS.

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THE BALTIMORE, MD., GAS-LIGHT CO.—We would call the attention of our readers to the letter of J. Mowton Saunders, Esq., of the Baltimore Gas-Light Co., which we publish in another column, referring to our remarks on page 40 of this volume, relating to the appointment of Prof. Aikin as inspector of gas. We cheerfully make room for the letter of Mr. Saunders, by which it will be seen we were misinformed as to the course of the company, although we had what we considered the most undoubted authority for making the statement.

GAS IN GERMANY.—A gas company has been established in the town of Landau. The municipal administration have contributed 20,000 florins towards the expense of building the works.

A contract has been made between the city of Emden and M. Spreng, director of the gas-works at Nuremberg, for the construction of gas-works at Emden. The city is to pay 92,000 thalers, to give a lease of the ground on which the works are to be built for 35 years, at a rent of 4 per cent. The public lighting will be done by means of 250 street lamps, for which the city is to pay for the gas at the rate of 2 thalers per 1,000 cubic feet. The private consumers are to pay 3 thalers 10 silbergroschen, per 1,000 cubic feet.

A wood-gas company has been inaugurated at Wittstock.

The production of the three gas-works of Gaudenzdorf, Presbourg, and Temesvar, Austria, were,

In 1859, 37,738,770 cubic feet.
In 1860, 44,065,660 " "

Showing an increase of 16.76 per cent.

ANSWERS TO CORRESPONDENTS.

L. S. K., of N. J.—*The purification of the oil is an expensive and tedious operation. Morfit's Chemistry Applied to the Manufacture of Soap and Candles will give you the information you desire.*

O. J., of Conn.—*We cannot give you the details. Experiments are now in course of progress, which will probably settle the matter. It is in vain to express an opinion, as in the present state of the process, it would be mere conjecture.*

E. P. R., of Vt.—*In gasometric research, carbonic acid must be prepared only from chalk and concentrated sulphuric acid. It will not do to use the more volatile muriatic and nitric acids, as a portion of these might be volatilized, and so contaminate the carbonic acid.*

A. J. E., of Pa.—*The fires which occur in coal-oil works are nearly always caused by the still head being blown off, and the escaping gaseous matter becoming ignited.*

E. G. W., of Ohio.—*Very likely. We are not at all surprised at the result. If you had consulted Bunsen, you would have been apprised of the action which always ensues under the circumstances named. Try it again, and remember that, to be sure of success, you must become well acquainted with the theory of the reaction.*

D. H., of Ky.—*We have an article in press, intended for our next number, which will answer your question in full.*

J. R. B., of Mich.—*A number of small gas-works, using only one bench of three retorts, employ clay, and they find no more necessity for the use of an exhauster than when using iron. The retorts of domestic manufacture we consider to be quite as good as the imported.*

J. E. T., of N. Y.—*Not always; although it may be assumed as a general rule. Try the first method recommended, and see how it results.*

CORRESPONDENCE.

TURKISH BATHS.

Philadelphia, July 17, 1861.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

Seeing, in your issue of July 15, 1861, a short article on Turkish baths, their establishment in London, and their probable establishment on this side of the Atlantic, I would say, that the probability of their establishment here has become a certainty, as we have, in this city, through the enterprise of M. Hlasko, in his Institute for Physical Education, a bath of that description and several others.

Respectfully, J. M. M., JR.

GAS-LIGHT IN CALIFORNIA.

Marysville, California, June 28th, 1861.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

Gas-Light business is constantly on the increase in this State. At this time there are five coal-gas works in operation—located in San Francisco, Sacramento, Marysville, Stockton, and San Jose; also, two making gas from pine-wood—one at Yreka, one at Placerville, also one building at Nevada, and the most of the principal places well supplied with water. I think we can compare well with many of the older States in improvements.

Yours, &c.,
D. E. KNIGHT,
Supt. Marysville Coal-Gas Works.

THE BALTIMORE, MD., GAS-LIGHT CO. AND PROFESSOR AIKIN.

Office Gas-Light Company of Baltimore, Md.,
August 5, 1861.

To the Editor of the AMERICAN GAS-LIGHT JOURNAL:

Dear Sir,—In your issue of the 1st Aug., commenting upon the appointment of Prof. W. E. Aikin, as inspector of the quality and illuminating power of the gas sold by the Gas-Light Company of Baltimore, you publish the following: "Had the Baltimore Gas Company acted with proper liberality, and introduced the photometer, and instituted regular tests of their gas for the satisfaction of their customers, there would have been no occasion to invoke municipal interference, for no grounds of complaint on this score would have been heard, &c."

Curiosity prompts me to ask, from whom you derived your information as to the narrow-minded policy of this company, in not purchasing photometrical apparatus, &c.

The learned Professor, whose advent into his new appointment you have heralded to the world, could not have said that we did not test the illuminating power of the gas, as he was present, upon several occasions, both at the office and Spring Garden Gas-Works, when his sense of sight would have falsified such an assertion. He may have stated that the company had not seen proper to appoint him chemical examiner of the purity of the gas sold by the company; but, had we felt satisfied of the vast influence such an appointment would have exerted over the minds of our consumers, you may rest satisfied that the learned Professor would have had the appointment tendered to him, with a salary large enough to meet your ideas of generosity; but as the time has gone by for our company to profit by your knowledge of his personal influence over the public mind, suppose you suggest to some of your metropolitan gas companies the idea of transporting his services from a climate where his merit has never been fully appreciated to your more discriminating soil.

But to dispense with badinage, you, as a public journalist, are well enough acquainted with the public mind to know, that any report upon the value of our gas, emanating from a paid officer of this company, would meet with equivocal success when compared with the report of an officer appointed by the corporate authorities of the city for that purpose, who is looked upon by a large portion of that community as antagonistic to the gas company. And, in conclusion, permit me to say, that if the "municipal interference" you appear to deprecate will satisfy the public mind, none will accord to them more heartfelt thanks than

Your humble servant,
J. MOWTON SAUNDERS.

N. Y. COMMON COUNCIL.

BOARD OF ALDERMEN.

By Ald. Farley:

Resolved, That a receiving basin be built at the northwest corner Fifty-ninth street and Third avenue, under direction Croton Aqueduct Board.

To committee on sewers.

The committee on lamps and gas presented a report directing the Harlem Gas Company to lay mains in Eighty-second street, between First and Second avenues.

Laid over.

Resolution from Board of Councilmen allowing the Superintendent of Lamps and Gas the use of a horse and wagon.

Ald. Froment moved its reference to the committee on finance.

Which was lost.

The resolution was then adopted on a division.

Resolution to place two gas-lamps in front of Hebrew Synagogue, Nos. 238 and 240 Fifth street.

Concurred in.

Resolution to place gas-lamp post on Bloomingdale road.

Concurred in.

BOARD OF COUNCILMEN.

Councilman Brice called up

Report of committee on lamps and gas, in favor of laying gas-mains in Tenth avenue, between Fifty-fourth street and Broadway.

Adopted.

By Councilman Brandon:

Petition of C. Van Cott to have the Sterling Gas Regulator placed in the public buildings of this city.

To committee on lamps and gas.

By the President:

Resolved, That the committee on ordinances be requested to report an ordinance which shall prevent Belgian pavement being disturbed after a street has been paved. That the owners of lots be directed to have drains connected with the main sewer in street; also, to have Croton pipe connected from main to the curb-stone; also, that no street shall be paved with Belgian pavement until a sewer shall have been built therein.

To committee on ordinances.

SANDUSKY, O.—Business very dull with the gas-company. Rather retrograding than otherwise since last year; but, withal, they manage to pay their debts, and give their stockholders a fair dividend.

ON TAKING OFF THE WASTE GAS FROM OPEN-TOPPED BLAST FURNACES.

By MR. SAMUEL LLOYD, JUN.

The writer having been requested at the last meeting of the Mechanical Engineers Society of London, to give a description of the plan now adopted at the Old Park Iron Works, Wednesbury, and several other works, for drawing off the combustible waste gas from blast furnaces without the use of a close top, has collected the following information on the subject. The plan now so successfully in operation was not hit upon at once, but only tried as a kind of last resource, after other modes of taking off the gas had been abandoned on account of being so injurious to the working of the furnace as to be inadmissible.

At the Old Park Iron Works the first attempt to make use of the gas was in 1849. It was thought that if three openings, each about two feet square, were made into the furnace about 12 feet below the filling holes, at equal distances round the circumference, and were connected by a brick flue to the boilers, enough gas would issue through them to raise the greater part of the steam required for the blast engine. These holes were accordingly made, opening into the brick flue which was built round the outside of the furnace. Practically, however, this arrangement did not answer, for it was found impossible to keep the brick flue air-tight, and it had not been long at work before several explosions took place; at last it blew up with a force which seemed almost to shake the whole works, and sent the bricks flying in all directions. To remedy this, a wrought iron tube was substituted for the brick flue. This was a great improvement, but still sufficient gas would not come down the tube to be of much service, owing to the blast engine chimney not being powerful enough, as it was only about 90 feet high and about 2 feet 4 inches square inside at the top, for seven boilers, several of which had still to be fired with slack to supply the blast engine with the required quantity of steam; so that there was but little draught left for the one or two boilers to which the gas was applied.

It was soon found that the holes in the furnace had a tendency to clinker up whenever the furnace was standing, owing to a return current of air setting in through them into the furnace, which occasioned a considerable quantity of mine to set quite hard around and beneath the holes, causing the furnace to slip and work so badly that they had to be filled up again. Instead of these, a wrought iron cylinder was introduced into the furnace top, and the end of the wrought iron gas tube, leading to the boilers, was inserted into the side of the furnace. Only a small portion of the gas, however, found its way down to the boilers, so that nearly as much flame appeared at the tunnel head as before the insertion of the cylinder.

At the same time an attempt was made to use the gas in one of the hot-air ovens, without making any alteration in the oven itself or its three chimneys, which were only about 6 feet high. A fan was fixed in a cast iron box, from which cast iron pipes, 12 inches diameter, were carried up outside the furnace, the end pipe entering into the furnace behind the cylinder. A larger pipe was fixed to convey the gas from the fan to the oven. The fan was driven at 900 to 1,000 revolutions per minute, which forced a considerable quantity of gas into the oven, the fan shaft being kept cool by being made hollow, with a small stream of water trickling through it. This experiment was not continued any great length of time, in consequence of the fan, which was an old one, breaking down; but it proved that, with a fan of sufficient size, it would be quite possible to draw off all the gas given off by a furnace. The writer, however, recommends as preferable for such a purpose, an exhauster on the plan of Lemielle's, described in the paper read before the Institution in 1858. This machine is extensively used in Belgium and France for ventilating coal-mines; and, from its slow motion, appears preferable to a fan, which, from its quick speed, is so likely to get of order.

The furnace had not been working long with the wrought iron cylinder inserted in the top, before the cylinder was burnt off and fell in, owing to the great heat at the furnace top, in consequence of so little of the gas being drawn down to the boilers. It was evi-

dent from these experiments that a much more powerful chimney was needed to draw down the gas efficiently. A stack was accordingly erected, 130 feet high and 6 feet 6 inches diameter inside at the top; and a new cylinder, like the previous one, was then inserted in the furnace top. This resulted in plenty of gas being drawn down, working very well under the boilers. The furnace, however, was injuriously affected, the make of the iron being lessened, and the quality not so good as before; the iron being white with a burden of fuel which ought to have produced grey forge iron. Several alterations were made successively in the plan of taking off the gas, but the furnace was more or less injuriously affected by each—the make of iron being in every case diminished, and the quality variable. On several occasions, portions of the coke and ironstone, that had been put in at the top of the furnace, were shovelled out at the bottom very much in the same state as when they were put in. A shorter cylinder, and one or two others of different sizes, were also tried, but without satisfactory result. The use of the gas was therefore entirely abandoned at the above works.

In 1852, Mr. Blackwell endeavored to make an economical use of the waste gas at the Bilston New Furnaces, and communicated the results of his attempts to the Institution, in a paper read in October of that year. In the first instance, the furnace upon which he tried the experiments was blown in with a cylinder inserted at the top; and it was found, as at the Old Park Iron Works, that constant slipping and fretting tuyeres, with all their attendant bad results, were the consequence. A close top was therefore tried, closed with a cone that was lowered for charging, and a great improvement in the working of the furnace immediately resulted; yet nothing but white iron was produced. In order, if possible, to produce grey iron, the burden was lightened two or three times; but although the cinder became exceedingly grey, still the iron was white. It was evident that the white iron was caused by the close top; and as it was important to produce grey iron, it was determined to sacrifice the use of the gas entirely, rather than continue making white iron. The gas was, therefore, allowed to escape freely by large openings made in the gas main, when a decided change was at once manifest; the iron became grey, and the furnace worked with regularity. The white iron had evidently been caused by the pressure produced by the close top; and the furnace appeared to be so sensitive to the slightest pressure, that the writer was informed, on visiting the works at the time, that even a strong wind blowing into the opening through which the gas was principally escaping, was found to throw the furnace back to white iron.

At Brymbo Iron Works, near Wrexham, the first attempt to use the gas was made in 1849, by the insertion of a cylinder in the furnace top, similar to the one already described as tried about the same time at Wednesbury. Though not so injurious to the working of the furnace as when applied at Wednesbury and Bilston, its effect was sufficiently unsatisfactory to cause the loss at the furnace considerably to exceed the saving at the boilers; so that, after some months' trial, it was taken out of the furnace, and the use of the gas abandoned for some time. A year or two afterwards, about the same time that Mr. Blackwell made the experiment just mentioned, a close top was tried on one of the Coalbrookdale furnaces at Horsehay, made with a cone similar to those that were answering satisfactorily at the Ebbw Vale furnaces in South Wales; but the working of the furnace was so deranged by the close top, that it had to be taken out; and no attempt has since been made to economise the waste gas in Shropshire. Soon after this close top was taken out, it was removed to Brymbo, where it was tried; but the furnace worked worse than when the cylinder was used. It was, therefore taken out again, and no further attempt was made to use the gas there till 1857, when Mr. Charles E. Darby decided to try the plan which forms the subject of the present paper.

This plan consists simply in inserting into the open furnace top a continuation of the descending tube conveying the gas down to the boilers, which reaches down into the centre of the materials to a sufficient depth to secure drawing off the gas without admixture of air.

In the arrangement of apparatus for taking off the gas from the open-topped furnace at Brymbo, and burning it under the steam boilers of the blowing engine, the wrought iron tube for taking off the gas is 3 feet 9 inches diameter outside, and is inserted into the centre of the open top of the furnace, which is 9 feet diameter. The descending main, 3 feet diameter, conveys the gas down the outside of the furnace to the horizontal main, which passes across the ends of three adjacent steam-boilers. The gas is delivered by a branch pipe, 22 inches diameter, into the furnace of each boiler, just above the fire door, where it is burnt by admitting the necessary supply of air through holes in the fire doors and through sliding doors above them, when more air is required. The ashpits of the boilers, under which the gas is burnt, are closed by iron doors. A small fire is kept on the grates, close to the mouth of the pipe which admits the gas, as a precaution against its ever entering under the boilers in an unignited state, after any temporary stoppage, and then causing an explosion by becoming suddenly ignited. The gas is drawn down from the furnace by the draught of the chimney, which is about 90 feet high, and rises about 40 feet above the level of the furnace top; it is 2 feet square at the top, giving an area of 4 square feet. The draught of this chimney, which is equal at its base to 0.74 to 0.84 inch column of water when the gas is being used, is found to be quite sufficient for drawing off enough gas for two boilers, but scarcely powerful enough to draw down the quantity required for three; for when the three are on, one-third more steam is not raised, as would be the case if the chimney were sufficiently powerful; since the furnace makes gas enough for three boilers—a quantity always escaping at the tunnel head, even when the three are on. The draught for a fourth boiler, which is worked with a coal fire alone, is supplied from another chimney.

The gas tube that is inserted into the open top of the furnace, consists of a wrought iron bend, made of ½-inch boiler plate, 3 feet in diameter, with a thick cast iron cylinder attached to it, which is buried in the charge of the furnace, and secured to the wrought iron bend by a rivetted joint. The cast iron cylinder is 3 feet 6 inches long below the joint, and recessed at top, to form a flush joint outside; the metal is 1⅛-inch thick, and increased to 2 inches thick at the bottom edge. The bend and cylinder are supported in their position by a centre bolt from a cross girder resting on the tunnel head; and the bend is bolted by an angle iron flange to the end of the gas main, which passes out in the space between two of the ordinary filling holes, four in number, which are thus not interfered with. The bottom of the gas tube is 5 feet below the level of the filling plates; and the materials in the furnace are filled up to the top of the cast iron cylinder, and should be kept at that level so as to ensure the end of the tube being always sufficiently covered in the furnace to prevent air being drawn in with the gas. A wrought iron hinged door, of about 3 square feet area, with a 56 lbs. weight upon it to keep it closed, is provided upon the upper part of the gas main, opening outwards, to act as a safety valve in case of any accidental explosion.

When the cylinder requires to be replaced, in consequence of the bottom burning away, the whole bend is detached and lifted out, and a fresh one fixed in its place; and so little work is required to make this change, that the whole delay caused to the furnace was only about three hours, the last time the cylinder was renewed. The plates of the descending gas main are only ¼ inch thick, and though the apparatus has been erected ten years, are still in good order.

In consequence of the success attending the new arrangement for using the gas at Brymbo, the writer recommended its adoption at the Old Park Iron Works, and it was decided to alter accordingly the apparatus previously tried there.

The apparatus now at work at the Old Park Iron Works, has a wrought iron gas tube, 4 feet 6 inches diameter inside, at the bottom, and 4 feet 9 inches at the upper part, and is made of ¼ inch boiler plate; and it is fitted with a cast iron cylinder, 4 feet 6 inches diameter, rivetted to the bottom, 2 inches thick at the lower edge, and 3 feet 6 inches in length, extending 6 feet below the level of the filling plates. From this tube a branch tube is carried out at a height sufficient to allow of the workmen passing underneath, so that the ordinary filling holes of the furnace are not interfered with. The branch tube is carried by a cast iron saddle, which serves to protect the under side of the tube from being injured by the flame of the furnace. The descending gas main is flat-bottomed, 4 feet 3 inches wide by 4 feet 6 inches high, and inclines gradually downwards to the steam-boilers of the blast engine, which are at a distance of about 200 feet from the furnaces. Two safety valves are provided on the gas main as a provision against explosion.

The gas is supplied to the boilers by a rectangular tube of 4 square feet area, brought down from the horizontal main, which extends along the end of the boilers; the supply of gas to each boiler being regulated by a flat slide-valve. The gas is admitted to the furnace over the fire door, and thrown against an inclined brick arch, which deflects it downwards to mix with the air entering at the fire door. The boiler has two flues, and is fired underneath, the flame passing underneath to the back, returning through the flues and back, on each side, to the chimney, which is 130 feet high, and extends 85 feet above the level of the materials in the furnace. The ashpit is bricked up, but a small fire is kept under each of the boilers, close to the fire door, as a precaution against the gas ever passing under the boiler unignited. There are six boilers heated by the gas from one furnace; these with two others supply the steam for the engine blowing three furnaces, a refinery, two cupolas, and about thirty smiths' fires.

It is contemplated to apply the gas from another furnace, to heat the hot-blast stoves; in which case it is proposed to use a cylinder cased with fire brick, and fixed simply by a rivetted joint at the top.

To prevent the tube being injured, whenever the furnace has to stand any length of time for tuyering or any other purpose, the materials in the furnace are allowed to work down. As they work down towards the bottom of the cylinder, the quantity of gas passing to the boilers diminishes, so that the engine man shuts it off from one boiler after another, until, by the time the bottom of the cylinder is about to become uncovered, it is shut off from the last boiler. If this should be omitted to be done soon enough, no explosion is found to result; but a back current from the boilers to the furnace is apt to set in and fire the soot and tar in the tubes: when the valves are all shut, these quickly become extinguished. As soon as the blast is put on the furnace again, it is filled with one or two charges of materials, which are kept at the furnace top ready; the valves at the boilers are then again opened, and a plentiful supply of gas is the immediate result. It was feared, that in taking off the gas, there might be a difficulty in the furnace standing for 12 hours every Sunday, as is the practice at the Old Park Iron Works: but by leaving it on the Sunday morning with the level of the materials below the bottom of the gas tube, no difficulty whatever has been experienced in letting the furnace stand as usual. Since the gas has been used, the last six barrows of coal and coke have been omitted in the last two charges every Sunday morning, for the purpose of lessening the amount of heat directly under the gas tube, without any injurious effect on the furnace.

The same plan of taking off the gas has also been employed, for the last three months, by Messrs. Fletcher, Solly, and Urwick, at the Willenhall Furnaces, Willenhall. In this case, the gas is taken from one furnace out of three, and is burnt under the boilers of the blast engine; serving to raise all the steam for blowing the three furnaces. This application has proved so satisfactory, that the apparatus is now being applied to one of the other furnaces, for the purpose of heating the hot-air stoves by the gas. In the boiler furnaces a little coal was at first kept burning, as a precaution to ensure the gas being always ignited; but it has not been considered necessary to continue this, and the fire grates have been covered with a layer of fire bricks, to form a complete hot chamber for the combustion of the gas: this arrangement has now been in constant use for nearly two months, without any objection being experienced. The chimney for the blast engine boilers is 120 feet high, and 8 feet diameter inside all the way up.

The furnace at the Old Park Iron Works was previously 8 feet diameter at the filling holes; but as it was desired not to diminish the area of opening at the top by the insertion of the gas tube, the furnace top was taken down about 9 feet, and rebuilt vertically, so as to obtain a diameter of 10 feet at the filling holes. By this means the area of opening around the gas tube was made greater than the previous area of the entire open top. The portion of the gas tube which descends into the material of the furnace is 4½ feet diameter, giving 16 square feet area, and the annular area around it is 78—16=62 square feet area; while the previous diameter of 8 feet gave only 50 square feet area. The effect of this increased area of opening at the furnace top is to allow the most complete freedom for the gas to escape at all times; for even if the gas valves be closed at all the boilers, and no gas be used under them from any cause, there is still an area left one-fifth greater than before for the gas to escape at the tunnel head.

The descending gas main to the boilers is 16 square feet area. The chimney is 130 feet high, and 6½ feet diameter inside at the top, or 33 square feet area, and is sufficiently powerful to draw off ordinarily the whole of the gas from the furnace; as shown by the fact that the top of the furnace is frequently so free from flame that a person might safely walk across the top of the materials. At times, however, owing to the materials giving out more gas than is drawn down the tube and consumed under the boilers, a considerable quantity escapes in flame at the furnace top. This is an evident advantage of the plan of taking off the gas from an open-topped furnace; since the furnace is in no case liable to be injuriously affected by any back pressure; the open top around the gas tube acting always as a self-acting safety-valve, which never allows the pressure inside the gas tube to exceed a definite small amount corresponding to the resistance of the 5 feet depth of materials through which any gas must pass that does not enter the tube. From experiments formerly made by Bunsen and Playfair, it was found that the pressure that exists at five feet below the top of the materials in blast furnaces is equivalent to a column of water ⅛ inch high. This is corroborated by the result of measuring the pressure in the top of the gas tube at the Old Park Iron Works, in which the above pressure was indicated at a time when there was a considerable quantity of gas escaping round the tube; at another time, when scarcely any gas was escaping, the pressure was found to be less than half that amount, being barely perceptible. It is a rather remarkable circumstance that every stroke of the blast engine was perceptible at the top of the furnace, in the increased pressure of gas in the tube, as shown by an ignited jet of the gas issuing through a small hole in the tube, which increased and diminished with each stroke of the engine. From this it is evident that any restraint upon the free escape of the gas must have its effect upon the whole furnace, checking to a proportionate extent the entrance of the blast into the furnace, and consequently retarding its action and diminishing its make, so long as such a back pressure exists.

The working of the open-topped furnace at the Old Park Iron Works, from which the gas has been taken off, has clearly proved that, allowing the gas to escape at the furnace top with the greatest freedom possible, is very beneficial to the working of the furnace; for, since taking off the gas, the average make per week has been greater than previously, while the materials used have been exactly the same. This will be seen by the following particulars, which are, in the first place, the amount of iron made by the furnace called No. 2, during the three months before the gas was taken off from it; and also the make of another furnace, called No. 3, of the same size, working at the same time,—the same materials and same quantity of blast being supplied to each furnace; and, secondly, the make of the same two furnaces during the last three months, while the gas has been taken off from No. 2, and not from No. 3.

	No. 2 Furnace. Tons.	No. 3 Furnace. Tons.
Total make of iron during 3 months before taking off gas	1486	1519
Total make of iron during last 3 months with gas taken off from No. 2 furnace	1652	1545

This increased make may be partly accounted for by the increased amount of blast supplied to the furnace by the blast engine since the gas has been taken off, owing to the pressure of the steam being kept up more uniformly since the boilers have been heated by gas.

At the Brymbo Iron Works, the furnace No. 2, from which the gas is taken off, has been working alongside another furnace, No. 1, of rather larger size, both being fed with the same materials. The following comparative statement shows the average weekly make of iron from each furnace, for a whole year, before the gas was taken off from No. 2 furnace, and for a corresponding period since, viz.:

	No. 2 Furnace. Tons.	No. 1 Furnace. Tons.
Average weekly make of iron during 1 year before taking off gas	104¼	105¾
Average weekly make of iron during 1 year with gas taken off from No. 2 furnace .	108½	110¾

The result shows a slight increase in the average make of both furnaces since the gas was taken off, of about the same amount in each, namely 4 per cent. in No. 2, and 4¾ per cent. in No. 1 furnace.

The saving effected at Brymbo in cost of fuel for the blast engine boilers, by taking off the gas, is shown by the following statement of the consumption of slack, reckoned as good coal, during the two years before and after the gas apparatus was applied:

Coal consumed at boilers per ton of iron made,	before taking off gas .	5.94 cwts.
Ditto ditto	after taking off gas .	1.29 cwts.
	Saving	4.65 cwts.

Say 4½ cwts. saving per ton of iron made, which, at 3*d.* per cwt., makes 1*s.* 1½*d.* saving per ton of iron made; and this, on the total make of 11,285 tons of iron from the two furnaces during the year, after taking off the gas, amounts to a total saving of £635. This is exclusive of the saving of labor in firing, wheeling away ashes, and boiler repairs; the amount of which is considerably lessened.

The consumption of coal in the two furnaces at Brymbo per ton of iron made, during the same two years, before and after using the gas from No. 2 furnace, was as follows:

Coal consumed in furnaces per ton of iron made .	before taking off gas .	44.18 cwts.
Ditto ditto	after taking off gas .	43.92 cwts.

The total consumption of coal per ton of iron made, including the blast engine boilers and hot-air stoves, was as follows:

Total coal consumed per ton of iron made	before taking off gas .	52.09 cwts.
Ditto ditto	after taking off gas .	47.01 cwts.

From this it appears that the total quantity of fuel consumed, per ton of iron made, has been less since the gas was used, although the furnaces have been supplied with a greater amount of lean ironstone during the latter period, as will be seen from the increased proportion of ironstone used, per ton of iron made, which was as follows:

Ironstone used per ton of iron made, before taking off gas		61.95 cwts.
Ditto ditto	after taking off gas	68.44 cwts.

being an increase of 10 per cent., after taking off the gas. Owing, also, to the great leanness of the ore, a greater proportion of lime had to be used in the furnaces, the amounts of calcined limestone, per ton of iron made, being as follows:

Calcined limestone per ton of iron made	before taking off gas .	15.08 cwts.
Ditto ditto	after taking off gas .	16.86 cwts.

being an increase of 12 per cent. in the latter period.

As regards the quality of the iron produced, there was no perceptible difference before and after taking off the gas: and from the foregoing particulars it is evident that, if the ironstone had been of equal quality after taking off the gas, the iron produced would have been a greyer quality: since rather less coal in the furnace has sufficed to reduce 10 per cent. more ironstone and 12 per cent. more lime. This is confirmed by the experience of the working at the Old Park Iron Works, the Willenhall Furnaces, and the Barrow Furnaces near Ulverstone, where the same burden of coal has produced iron of a slightly greyer quality since the gas has been taken off.

The working of these furnaces appears to lead to the conclusion that the open-topped plan of taking off the gas is preferable to the use of a close top; for with the latter there is occasionally a considerable pressure on the materials at the top of the furnace, owing to its producing at times more gas than is drawn off, and a tendency to change the quality of the iron produced from grey to white, as was proved at the furnace at Bilston, previously referred to.

The open-topped plan can be readily adapted to any existing furnaces without the necessity of raising their height, as is requisite with the close-topped plan to allow room for the apparatus. It is also worthy of note, that the working of every furnace, where this plan has been tried, has been improved, which the writer believes is not the case where a close top is used. In several furnaces working with close tops, a larger quantity of fuel has been found necessary to produce the same quality of pig iron. In one case, at Middlesborough, where a superior description of close top is used, the furnace takes 5 to 7 per cent. more fuel per ton of iron made. At another ironworks there, the writer was informed that the extra quantity of fuel required by the furnaces when working with close tops, quite counterbalanced the saving of slack at the boilers. This is directly contrary to the experience of those who have used the open-topped plan described in the present paper. There is one point of difference between the two plans which must not be unnoticed: with a close top the gas may be burnt under boilers, and in stoves or heating furnaces, without any high chimneys being necessary to create a draught, the gas being forced down from the furnace by not being permitted to escape at the tunnel head; whereas, with an open top, a chimney of sufficient height and area to produce a good draught is essential to draw of the whole of the gas produced by a furnace. The writer believes, however, that a close-topped furnace would work much better if the whole of the gas were drawn off as it rises, and that there is a loss, instead of any saving, in not providing sufficiently powerful chimneys to effect this; the experiment made at Bilston, having clearly proved that any pressure of gas in the furnace top is injurious, at least with Staffordshire materials.

In conclusion, the author remarked, that the great importance of the question is apparent from the fact, that the saving effected by making use of the waste gas from one furnace, on the plan now described, is equal to from £500 to £1,000 a year, according to the value of slack at different works. Taking the average saving at £750, if the plan were adopted at only 100 of the 126 furnaces now in blast in south Staffordshire, an annual saving of no less than £75,000 would result to this district alone.

Mr. C. Cochrane said, the statements given at the previous meeting, respecting the working of the close-topped furnace at Middlesborough, then described, had been fully confirmed by subsequent results. The close-topped furnace, from which the gas was taken off, was one of the three furnaces, all working under the same conditions of materials and blast; and the results of working, for the month of September, were that the average quality or "number" of iron made by the close-topped furnace during the month was 3.16, taking the range of numbers 1 to 4 for foundry iron, and 4 to 6 for forge iron; and the two other furnaces yielded average qualities of 3.18 and 3.01, showing no appreciable difference in quality in the make of the close-topped furnace. The consumption of coke was 31.89 cwts. per ton of iron in the close-topped furnace, and 31.21 cwts. and 31.02 cwts. in the two other furnaces; showing a consumption of 2 per cent. and 3 per cent. more coke, respectively, in the close-topped furnace; which was a further improvement, as had been then anticipated, upon the result stated at the previous meeting, when the consumption of coke had been reduced from 7 per cent. to 5 per cent. greater in the close-topped furnace. The total make of iron in the close-topped furnace, during the month, was 818½ tons, of which 31 tons were mottled iron, and 16½ tons white iron; amounting altogether to less than 6 per cent. of mottled and white iron out of the whole quantity. In some close-topped furnaces, the working of the furnace was impaired by the mode of filling; the top being closed by a cone that was lowered into the furnace in charging, which reduced the height of the materials, so that the heat was not so thoroughly taken up, and a greater consumption of coke was required; but by having the cone made to draw upwards for charging, on the plan he had adopted, the materials could be kept up to the same height as before, and any objection on this ground removed.

One cause of the increased make of the furnace described in the paper had, he thought, been overlooked, namely, the improvement arising from enlarging the tunnel head; for it is well known that a wider mouth increased the make of a furnace, by allowing a larger quantity of blast to pass through it than was possible with a smaller top.

Mr. J. Fenton thought the make of the open-topped furnace described in the paper, 104 tons per week, seemed a small amount for a hot-blast furnace; and he enquired what was the temperature of the blast, and whether the ore was calcined before going into the furnace. At Low Moor, the weekly make of one large furnace was about 120 tons of cold-blast iron, from a lean stone containing only 28 per cent. of iron; the furnaces were rather larger than that described in the paper, measuring about 12 feet diameter at the top and 14 feet at the boshes. He asked whether the limestone used was carboniferous or magnesian.

Mr. Lloyd said the temperature of blast was about the melting point of lead, but sometimes below. The ironstone used at Brymbo was of a lean description, containing only about 26 per cent. of iron, so that the make of the furnace was rather less than would be got with such an ore as had been mentioned. In the furnace at Wednesbury, the make of which was about 124 tons per week, the ironstone used was chiefly that know as Blue Flat, containing rather more than 30 per cent. of iron; and also New Mine ironstone, containing about 25 per cent. of iron. The quality of iron produced was very good. The ore was calcined beforehand, and the limestone was the silurian. The furnace was 10 feet diameter at the top, 12 feet at the boshes, and 4 feet 6 inches in the hearth, and the total height was 47 feet to the level of the filling plates.

REPORTS OF GAS-LIGHT COMPANIES.

BRIDGETON, N. J.

From July 12, 1860, to July 11, 1861.

Balance on hand	246 84	Paid for coal	1201 82
Rec. for coke and lime	86 13	" repairing bench and retorts	478 44
" rent, wharfage, &c.	73 16	" meters	100 00
" service pipe, cocks, &c.	116 26	" lime, taxes, pipe, &c.	280 80
" for gas	4531 85	" wages and salary	1155 00
		" for lot	50 00
		" interest	87 68
		" dividend No. 3.	580 20
		" bond and mortgage.	520 00
		" dividend No. 4	580 20
		Balance	20 10
	$5,054 24		$5,054 24

Accidents in Coal Mines.—The usual annual reports of the government inspectors of coal mines in Great Britain—those relating to the casualties which occurred in 1860—have now been printed. They show, unhappily, that although the number of separate accidents exhibits a diminution of nearly 5 per cent. as compared with the preceding year, the deaths resulting therefrom have increased to the fearful extent of more than 22 per cent. Upon the whole, however, the reports cannot be regarded as unsatisfactory, there being a general diminution in the number of deaths, with the single exception of those from explosions; and as to the casualties under this head, it is but just to remark, that the difference is attributable to the occurrence of three destructive explosions, in districts usually almost free from this class of accident. Taking the amount of coal raised in 1860 at 72,000,000 tons, which is very nearly the truth, it appears that one death occurred for each 64,924 tons of coal raised. The proportion of deaths from each class of accident was:—From the explosions from fire-damp, one death for each 198,347 tons of coal raised; from falls in the mine, one death for each 185,567 tons raised; from accidents in shafts, one death for each 395,604 tons; from miscellaneous accidents under-ground, one death for each 1,333,333 tons raised. Again, the reports under consideration show that whilst the average number of lives lost for each 1,000,000 tons of coal raised during the five years ending 1859, was about 15.5, the number during 1860 was about 15.4, a circumstance which shows that, although the exceptionable accident from explosions during the year reported upon, necessitates an unfavorable comparison with the preceding year, there has been a trifling improvement as compared with former years.

FOREIGN NEWS.

RECENT ENGLISH PATENTS.

A patent has been granted to Henry Alfred Jewett, C. E., of Sawley, in the county of Derby, England, for "*Improvements in the method of heating or firing ovens for the manufacture of pottery and porcelain by means of gas, and in apparatus connected therewith.*" In this invention illuminating gas is used in calcining pottery, but not alone—atmospheric air and steam performing an auxiliary part—the former in supplying the requisite quantity of oxygen to ensure perfect combustion, and the latter being used to increase the intensity of the heat as in a blow-pipe and to diffuse it equally, but in one volume.

The shape of the oven determines the the construction of the burner by which the gas air and steam are employed in heating the retorts in which the china or earthenware articles are fired. The patentee claims, first—the construction of a hollow fire-clay brick, with separate compartments for the introduction therein of the three agents to be combined for producing the intensity of heat, and which the *Journal of Gas-Lighting* thus describes:

On one side of the hollow brick is attached, in moulding the same, a fire-clay tube, of 2 inches diameter, and 6 inches in length, at an angle of 45°, the end of which is moulded in the upper compartment for gas, and the lower one being for the admission of the air and steam by a transverse division in the lower compartment of the brick. These solid bricks and hollow brick burners will be built in the oven as bricks are now built—that is to say, in a round oven, the first layer or circle will be a solid brick, built on the stock or foundation bricks; the second layer will be the hollow or burner brick; the third layer the solid brick laid upon the burner brick and so on alternately, until the conical oven is considered of a sufficient height, and by a series of pipes, uniting each and every hollow brick externally by short pieces of tube from the upright pipes, the lower ends of the latter are inserted into a circular hollow casting, which is made in two halves, and bolted together by flanges, and traversing externally and entirely around the circular oven. This casting is the receptacle for the inflammable gas, which is supplied by a main pipe direct from the gasometer, and which can be regulated by a main stop-cock. The upright pipes are closed at the top, so that the gas passes over them through the short connecting pipe into the upper compartment of the brick, and from thence igniting in the interior of the oven upon the fire-clay tube, which is moulded on the hollow brick of the oven, the gas, air, or steam will be admitted, and perfect combustion effected in the interior of the oven, and regulated to the greatest nicety from the exterior. Should it be found necessary to increase the heat more than the present plan described will give, the solid bricks may be dispensed with, and hollow burner bricks substituted, and a hollow column of fire-clay in the centre of the oven, with burners all round it from the base to the height of the other burners; this column to be supplied with gas, air, and steam, by pipes or flues underneath the floor of the oven.

A patent has been granted to William Clarke, of London, for "*improvements in the manufacture of gas,*" in which the invention consists of the introduction of a large amount of pure or nearly pure hydrogen gas into the retorts during the distillation of coal. This gas is previously made and stored in suitable gas-holders, without being purified. Before being admitted into the retorts, it is heated by the waste heat of the furnace. This hydrogen gas is intended to act on the carburetted vapors evolved in the retort, and to combine with the resulting illuminating gas. It is said that it will protect, at the same time, the olefiant gas from contact with the red-hot retorts and from consequent decomposition—first by its interposition, and afterwards by its impulsive force which it gives to the products of distillation, which will be rapidly expelled from the retort without producing pressure or vacuum. One advantage claimed in this invention is, that no danger is apprehended by a too rapid revolution of the exhauster, as the reserve hydrogen gas-holder will always compensate for the extra exhaustion, and thus prevent a vacuum forming in the retorts, or the introduction of any atmospheric air.

A patent has been granted to John Griffith Williams, of the county of Monmouth, for "*improvements in extracting inflammable and other noxious gases from coal and other mines.*" The object of this invention is to obviate the danger arising from the presence of "fire-damp" or "choke-damp," and to convey them away from the mines as soon as they issue from the seams. This is done by conveying a ramification of pipes into the several workings of the mines, and to connect them with a suitable apparatus for exhausting the gases from the workings. The gases so extracted are to be allowed to escape into the air, or fired and consumed.

In extracting the lighter inflammable gases or "fire-damp" from the workings, ascending branch pipes are fitted into the main pipes, and arise to the tops of the cavities in the upper part of the workings, so as to be surrounded by the gases which may collect in such places. But when "choke-damp" or carbonic acid is to be extracted, the pipes must descend to the bottom of the shaft, whence the gas may be extracted by means of pumps.

A patent has been granted to E. Pulls, of London, for "*obtaining products from coal, gas-tar, gas-pitch, coal-tar, asphalte, resin, &c.,*" in which the invention consists of a mode of obtaining products from the above-mentioned substances, by mixing them with a mineral acid or acids, or other oxidizing chemical agent, and subjecting the mixture to distillation in the usual manner. If the material to be operated upon is solid, (such, for example, as pitch, coal, or asphalte,) it may be first broken into powder or small pieces. He prefers to use sulphuric acid as the oxidizing agent, on account of its cheapness, but any agent which will be sufficiently cheap, and will impart sufficient oxygen to the material to be operated upon during the process of distillation, may be used. If the oxidizing agent be fluid, such as sulphuric acid, he prefers to mix it with powdered charcoal, or some other powder which will not neutralize its effects, before adding it to the bituminous or resinous substance to be operated upon, and he mixes a fluid oxidizing agent with powder for the purpose of insuring a more even distribution or mixture of it amongst the particles of bituminous or resinous material.

Importance of Fresh Air.—What took place in a lamp, or anything burning, was just what occurred in the human body. The warmth essential to life was maintained by a kind of oxydation of carbon. The result of the oxydation of carbon in the human body was precisely the same as that which took place out of it. Without sufficient oxygen in the air, a lamp would go out: so the carbon in the body could not perform its heating functions without sufficient oxygen from the atmosphere breathed. A knowledge of even that much of chemistry might be the salvation of thousands of people who were now, by their malpractices, laying the foundation of fatal diseases: persons shut themselves up in close rooms; never opened their windows; blocked up their chimneys; had their curtains close drawn; and made every arrangement to prevent the proper supply of oxygen, upon which their lives and health depended. The fire of life would go out as soon in man without oxygen, as would the light before the lecturer if an extinguisher were placed over it. The present style of dress limited the quantity of oxygen which went into the lungs, and thus limited the amount of combustion and change necessary to health, and caused a tendency to one of the most dreadful diseases of the present day: he believed that a large proportion of the cases of consumption which prevailed amongst females arose from their vicious system of dressing: this evil, however, was not so bad as it was. He called their attention to this as one case in which there was a necessity for the application of physiological principles.—*Builder.*

Elizabeth, N. J.—Water-works built in 1855-56. Cost $100,000. Capacity of reservoir 6,000,000 gallons. Average daily delivery 500,000 gallons. Water obtained from Elizabthtown Lake and distributed through 7 miles cement pipe.

Camden, N. J.—Water-Works cost $150,000. Capacity of reservoir 5,000,000 gallons. Average daily delivery 500,000 gallons. Supply obtained from Delaware river at a point 2 miles above the town. Use the Cornish pump.

PATENTS.

UNITED STATES.

1,709.—J. S. Rand, of North Providence, R. I., for an Improvement in Water Elevators:

I claim the combination of the bucket, A, constructed as described, with the arms, C, trough, B, bar, F, latches, H, shaft, K, and arm, m, in the manner and for the purpose set forth.

1,712.—J. W. Redding, of Belleville, Ohio, for an Improvement in Pumps:

I claim the cylinders, B B, flaring at top and united at bottom by curve, C, into which flows the induction pipe or cylinder, c; also, the confluent pipes, E E, air chamber, H, and discharge pipe, I, all combined and arranged as described, when operated by means of the fulcrum, M, piston rods, N N, pitman, P, crank, O, and wheel, R.

1,717.—John Russell, of Troy, N. Y., for an Improvement in Lamps:

I claim, in combination with the wick tubes and wick of lamps, the water reservoir, B, tube and wick, b, or its equivalent device, for producing and introducing the vapor of water, or of any similar fluid, in or in contact with the lamp flame, substantially in the manner and for the purposes as described and shown.

1,718.—Wm. G. Schmidlin and J. W. Driscoll, New York City, for an Improvement in Reflectors for Lamps:

I claim the curved sections of glass applied within the curved metallic reflector in the manner and for the purposes specified.

1,720.—T. J. Southard, of Richmond, Maine, for an Improvement in Pumps:

I claim the combination of the weighted fly wheel, the slotted pendulum, crank pin, M, and lever, H, operating two or more pumps, when arranged substantially as set forth.

1,734.—James Poole (assignor to himself and Jas. Ingram), of New York city, for an Improvement in Gas Burners:

I claim the deflecting button, b, wire gauze, c e, and disk, d, applied in the gas burner in the manner and for the purposes specified.

1,735.—Jacob Reighard, of Birmingham, Pa., assignor to Hale, Atterbury & Co., of Pittsburgh, Pa., for an Improvement in Glass Lamps:

I claim a new article of manufacture produced in the manner described, to wit, a glass lamp which has two distinct openings, a b, in its top, one in the centre for the introduction of the wick into the lamp, and the other at one side of the centre, for filling in the oil or other burning fluid, substantially as and for the purposes set forth.

1,736.—Benjamin Arnold, of East Greenwich, R. I., for an Improved Lamp Shade:

I claim the combination of the rings and levers, substantially as described, and for the purpose herein set forth.

1,743.—Lewis Boore, of Buffalo, N. Y., for an Improvement in Dry Gas Meters:

First, I claim so operating the valve as that an equal longitudinal and transverse movement will be given to it, so that all points of the valve will move over equal surfaces and describe equal circles for the purpose and substantially as described.

Second, I claim the cross, i i' i'', in combination and arrangement with the valve, F, and operating crank, for the purposes and substantially as described.

1,749.—Richard S. Child, of Philadelphia, Pa., for an Improvement in the Utilization of Coal Tar:

I claim the process herein described of utilizing coal tar, by converting it into roofing cement and lampblack, instead of into lampblack and a worthless residue, or into roofing cement and volatile substances.

1,750.—John Chilver, of Jersey City, N. J., for an Improvement in Molds for Molding Pipes of Plastic Materials:

I claim, first, The construction of a mold with its flat bottom, and its projection, L, whereby the sections of pipe made therein may be readily coupled, and have a continuous base, substantially as herein described.

Second, The combination with the flask of a mold of a core of uniform size and shape from end to end, constructed so as to expand and contract, substantially as described.

Third, The combination of the sectional bed-plate and collar with the flask of the mold and with an expansible and contractable core, combined and operating substantially as described.

1,751.—Neil Clifford, of Brooklyn, N. Y., for an Improvement in Vapor Lamps:

I claim the arrangement of the tubes, C, K, and wick tube, H, when used in connection with the plug, E, and socket, D, placed in the curved part, a, of the tube, C, and in relation with the wick tube, H, and straight or upright portion of tube, C, to operate as and for the purpose set forth.

[This invention relates to an improved lamp of that class in which volatile hydro-carbons are burned, and the burning material vaporized by a supplemental flame, in order to supply or feed the illuminating flame.]

1,763.—J. W. Graham and J. M. Topliff, of Pittsfield, Ill., for an Improvement in Water Elevators:

We claim, first, In combination with the shaft, a, the loose roll, B, and gears, i f g, and clutch, G h, the whole constructed and operating substantially as described, for the purpose set forth.

Second, We claim the combination of the windlass having reversed hellical grooves, with the cords and water bucket, and the device for opening the valve of bucket, the whole arranged and operating as described, for the purpose set forth.

Third, We claim, in combination with the elevating and automatically discharging bucket and grooved windlass, the blank, u, as and for the purpose specified.

Fourth, We claim constructing the bucket with a mouthpiece, p, in combination with its valve and opening mechanism, and a filling valve in centre of bucket's bottom as described, for the purposes set forth.

1,771.—W. B. Le Van, of Philadelphia, Pa., for an Improvement in Water Gauges for Steam Boilers:

I claim, first, So arranging the valve, in respect to the internal rod, I, that the centre line of one shall coincide, or nearly coincide, with the centre line of the other when the rod or valve, or both, are so constructed that the valve can be operated without disturbing or being disturbed by the rod, as set forth.

Second, So constructing the valves, G in respect to the said internal rod, or the rods, in respect to the valves, that the latter can be operated without disturbing the former, as set forth.

Third, The hollow branch, b, of the steam chest, A, combined and arranged in respect to the opening of the valve, G, as set forth, so as to afford ready access to the interior of the glass tube, as specified.

1,784.—J. A. Sabbaton, of New York City, for an Improvement in Dry Gas Meters:

I claim the combination of a series of flexible diaphragms with a conical valve having an inlet passage at one of its heads, and outlet passage at its other head, two lateral ports communicating respectively with the inlet and outlet passages, and turning in a conical valve seat fitted with as many ports as there are chambers in the meter, the whole arranged and operating substantially as described.

I also claim the combination of the said valve and valve seat with an inclosed inlet passage, a supplementary port in the valve seat, and a supplementary passage in the valve, substantially as described.

I also claim the combination of the stems of the flexible diaphragms with conical stoppers and stopper seats, substantially as described.

1,793.—Erastus Stebbins, of Chicopee, Mass., for an Improved Faucet:

I claim connecting the valve, C, to the screw shaft, F, by means of the collar, E, which is screwed on the cylinder, f, of the valve, C, and is connected to the lower end of the shaft, F, by the flanch, j, and recess, k, when said collar is used in connection with the packing, h, secured to cylinder, f, and fitted between the cap, D, and the box or projection, d, of the tube, A, substantially as described.

[This invention relates to that class of faucets or cocks in which to dispense with the use of a spring, and open and close the valve the valve is operated by a screw. The object of the invention is by the screw alone, and at the same time have the packing of the cap attached to the screw shaft or stem, so as to admit of the perfect working of the valve, while effectually preventing the escape of water around the cap.]

1,798.—A. K. Tupper, of Pontiac, Mich., for an Improvent in Gas Retorts:

I claim the combination in the retort of the upright partition, a, the reversed inclined partitions, d d1 d2, on the one side of a, and the chamber, B, without partitions on the opposite side of it, all substantially as specified.

1,800.—J. C. Wightman, of Boston, Mass., for Improvement in Gas Cocks:

I claim the construction of a cock or stop for gas or air of two cylinders joined together and with a communicating passage between them, one of said cylinders being furnished with an adjustable plunger or displacer, and a mercury cup, by means of which the flow of gas through the other may be regulated in quantity or entirely stopped, the whole being constructed, arranged, and operating as set forth.

Reductions in the Price of Gas in Great Britain.—The London *Builder* announces further reductions in the price of gas in several parts of the United Kingdom.

The Swansea, Wales, Gas Company have just reduced the price of gas from 5s. 10d. to 4s. per 1,000 cubic feet, being compelled thereto by their Parliamentary Act.

The Worksop, England, Gas Company have declared a dividend of 8 per cent. upon the old, and 7 per cent. per share upon the new share capital of the company. The directors have, within the past four years, reduced the price of gas from 6s. 8d. to 5s. per 1,000 cubic feet. The capital of the company is £14,700.

The Galashiels, Scotland, Gas Company have agreed to reduce the price from 7s. 6d. to 6s. 5½d. per 1,000 cubic feet.

Gas in Scotland.—The agitation in Scotland for cheap gas is extending, and the gas companies there do not appear to be taking any efficient means to check it. To reduce the price after the clamor has been raised, is a poor expedient that only serves to show there was justice in the outcry, and tends to encourage agitation in other places. This is not the time for asserting absolute rights, nor for the maintenance of a proud reserve; the gas companies ought to take the public into their confidence by publishing full and clear statements of their affairs, showing the actual cost of coal and materials for the manufacture of 1,000 cubic feet of gas, the expenditure for renewals and repairs, the expenses of management and distribution, and the profit derived from the quantity of gas sold and paid for. If that were done fairly, fully, and freely, the respectable gas consumers would feel satisfied, and would no longer be misled by the exaggerated and false statements of agitators, which, though they may fail to raise any substantial opposition, excite discontent and enmity between the gas companies and their customers, which is annoying and prejudicial to all.—*Journal of Gas-Lighting.*

PORTABLE GAS-WORKS.

MARSH'S PATENT ROSIN OR Sun-Light Gas-Works, for Private Dwellings, Hotels, Factories, Railway stations, Sugar-houses, Towns, &c. By the peculiar construction of the Retorts, the largest amount of decomposing surface is obtained in the smallest space. 2d. Gas is manufactured from crude rosin, without the least deposit of carbonaceous matter in the retorts or pipes: thus enabling them to be operated continuously, generating rapidly the best and cheapest illuminating gas obtained from this material. ALFRED MARSH & CO.
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MARYLAND GAS COMPANY are constantly constructing their superior Patent
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of any capacity, from that required for Private Dwellings, Public Buildings, &c., to such as will supply Cities and Towns, complete in all their parts, for the manufacture of Gas from either Rosin, Oil, Coal, or Rosin.
P. S.—This Company also manufacture a superior article of ROSIN-OIL, especially for Gas purposes. Their experience for the last nine years has secured for them a perfect success of their Gas-Works. Address
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Agents wanted in other cities to sell rights or machines.

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56 Washington street, Boston.
For Engravings, see American Gas-Light Journal for April, 1860, page 213.

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Boiler Flues,	Back Pressure Valves,
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SCIENTIFIC BOOKS.

GAS ENGINEERS' LIBRARY.—A few works indispensable to Engineers, Contractors, and others engaged in the construction of Gas-Works and manufacture of Gas, have been selected, out of a large stock of chemical and other works, and are recommended to the attention of those interested. See page 208, vol. II, of this Journal.
For sale at the Rooms of the American Gas-Light Journal, New York.

PLUMBERS & GAS-FITTERS.

LOCKE & CRAIGIE, Plumbers and Gas-Fitters, No. 12 East 20th street, New York.

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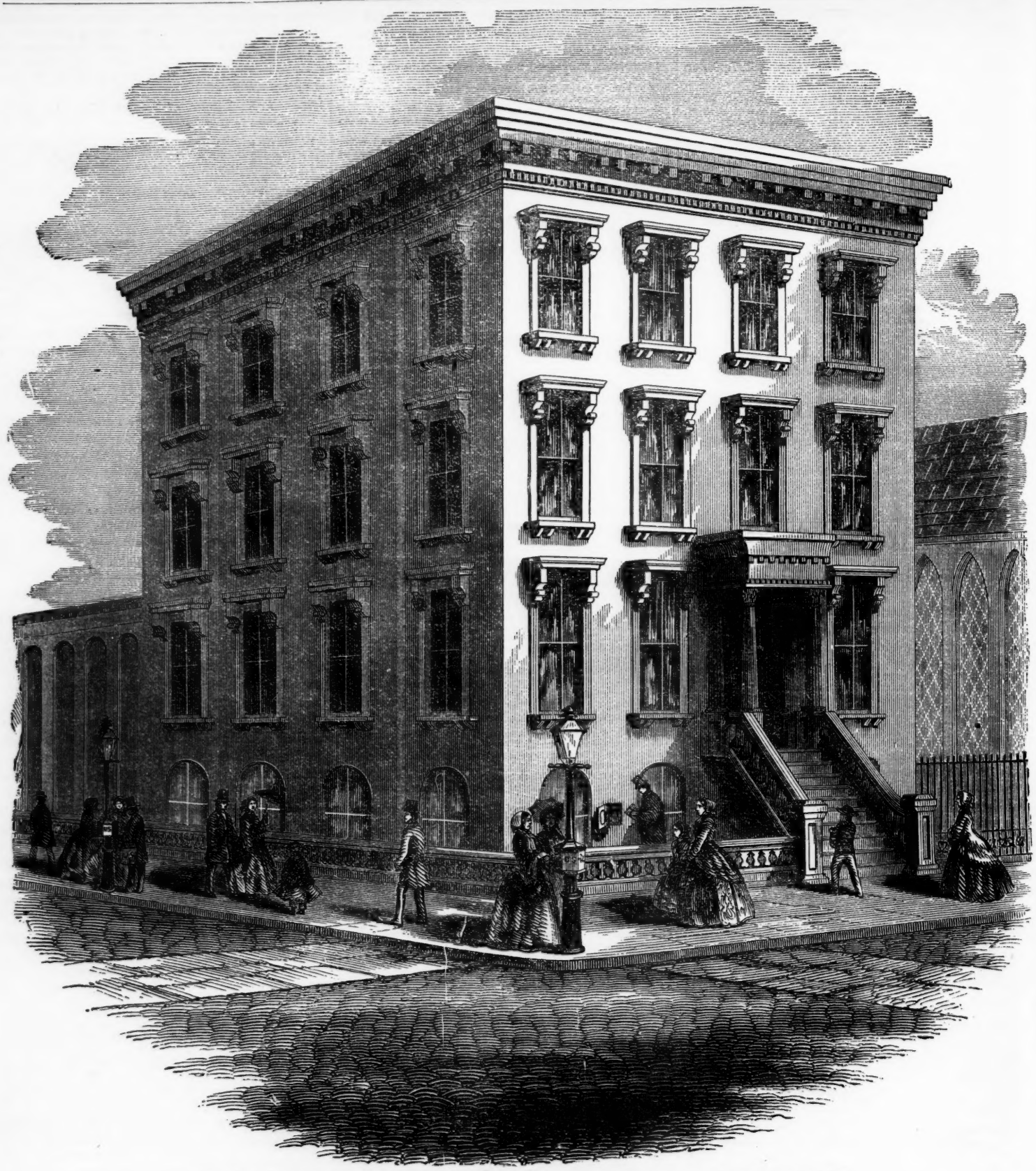
ANTI-FREEZING APPARATUS.

FREEZING OF GAS-PIPES.—Walton's Patent Anti-Freezing Apparatus illustrated by Engravings in the American Gas-Light Journal, of Jan. 1, 1861, page 212, is the most simple, durable and efficient of any known process.
See also certificates from Cincinnati, O., and Louisville, Ky. Gas-Works in same number, page 208. Address, JOHN WALTON,
Sup't Gas-Works, Louisville, Ky.



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1.—Improved Mode of Setting Gas-Meters in the Walls of Buildings.

2.—Cast-Iron Mail-Stations for Public Lamp-Posts.

Adopted by the UNITED STATES GOVERNMENT for the Principal Cities.

ALBERT POTTS, Philadelphia, Patentee.

By the FIRST IMPROVEMENT the Meters may be inspected at any time from without, by the agents of the Gas-Company having keys for that purpose. Thus burglars need no longer gain admittance to dwellings under pretense of examining the meters, while they, in fact, examine the fastenings. The meter-box, being neatly and securely imbedded in the front wall, the meter is protected against frost by means of a thick pad on the back of the door. It has been satisfactorily tested in long continued severe weather and found to be eminently successful.

The SECOND IMPROVEMENT speaks for itself. The cities of New York and Philadelphia are already supplied with these boxes, and the convenience to the citizens and increase of revenue to the Post Office Department are most marked. Always in sight, securely fastened to the most public objects, protected by light, day and night, they have become the most popular of all modern improvements and will be immediately adopted throughout the country.

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Thomas Glover's Meters have now been in use in the United States and British Provinces, for the last Fourteen Years, and are extensively used by many Gas Companies, to their entire satisfaction; and R. Glover can with all confidence refer to them in proof that Thomas Glover's Meters are— the most Perfect in Principles— the most Correct in Registration—and more Durable than any other Dry Gas Meter made in the United States or Great Britain. R. Glover will at all times be glad to repair any Gas Meters sent him at the above factory. If any of them are of Thomas Glover's manufacture, and of a more recent date than Three years, he will make no charge.

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ALSO, BUNSEN'S PHOTOMETER, WITH COMPLETE APPARATUS FOR WORKING THE SAME

* The standard of measurement of this Gas-Holder is given by Professors Torrey, of the U. S. Assay Office; Joy, of Columbia College; Gibbs, of the Free Academy, and several other distinguished scientific gentlemen.

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The high reputation which we have enjoyed for more than twenty-two years, and the fact that we have manufactured a greater number of Gas-Meters than all other manufacturers in this country combined, must present itself as a security to parties desirous of securing the most reliable instruments. Having completed a most extensive addition to our Factory, and added many important improvements to our machinery, we are enabled to fill orders entrusted to us with despatch, and in all cases *guarantee entire satisfaction.* Our Patent Rotary-Valve Dry Gas-Meter is now used by upwards of Two Hundred Gas Companies, giving general satisfaction; we therefore recommend it, believing it superior to any other Dry Gas-Meter manufactured. All Meters tested separately by a sworn Meter-Inspector, and sealed when desired.

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Purchasers may at any time inspect our Works, and the materials of which our Meters are manufactured. We are fully prepared to execute all orders, upon the shortest notice, and it will be to the interest of parties to call upon us.

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Improves the Light and Saves a Large Per Centage of Gas.

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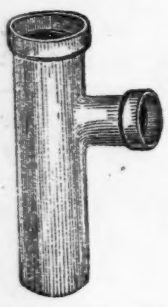

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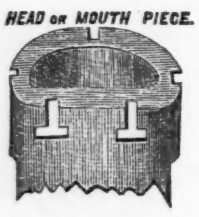

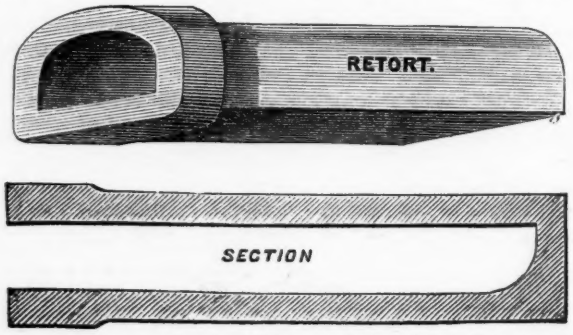

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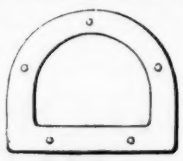

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J. C. & CO. make Fire-Clay Retorts of all shapes and dimensions, and to fit existing mouth-pieces.
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